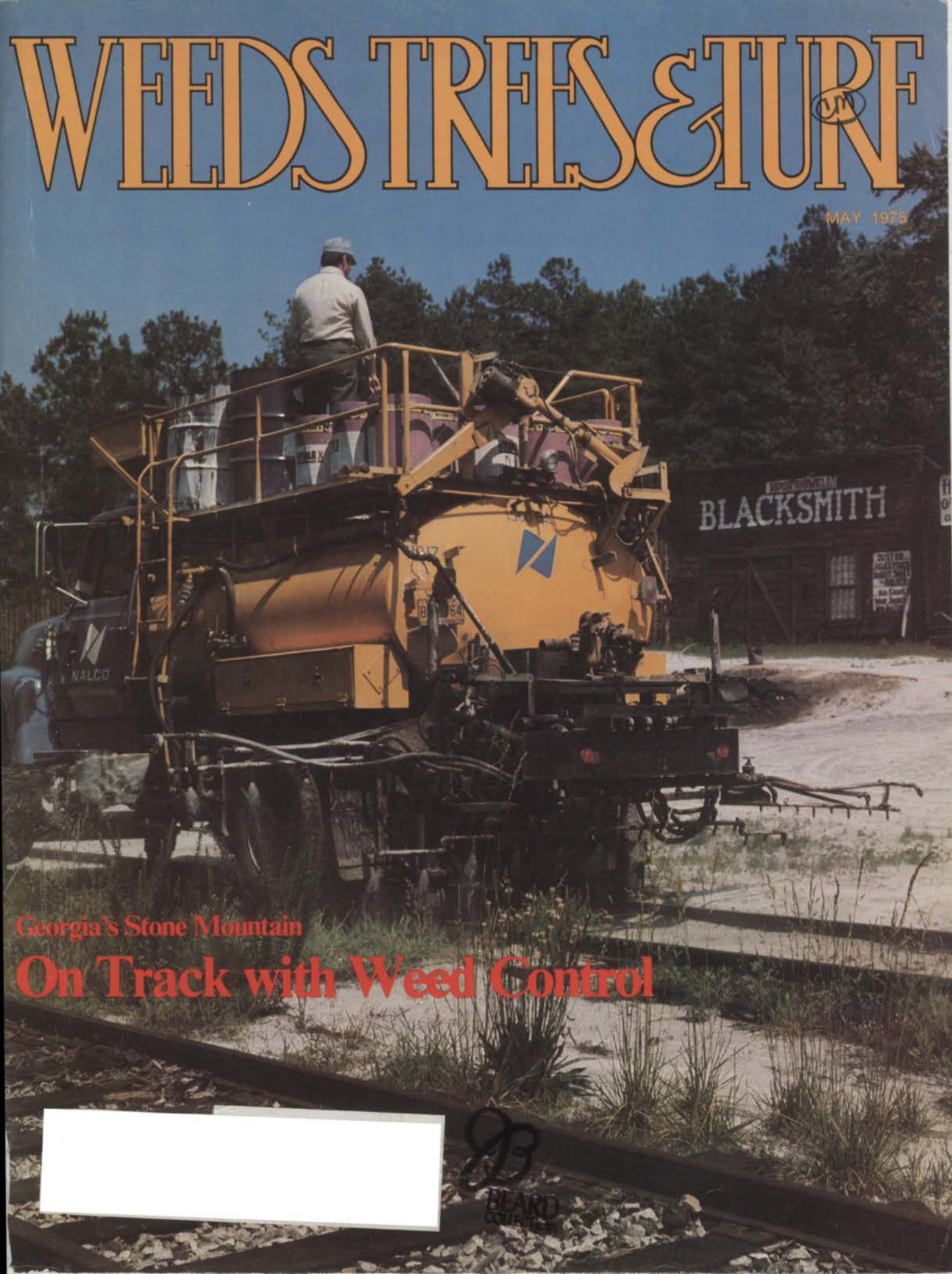
WEEDS TREES & TURF

MAY 1975



Georgia's Stone Mountain

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Stop in to see your dealer soon, and take a look at the Lo-Boy. He's all the help you'll need.

INTERNATIONAL HARVESTER

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WEEDS TREES & TURF®

May 1975, Vol. 14, No. 5

10 RAILROAD WEEDS: One Headache You Can Do Without — Ask Alexander Hamilton McAfee, president and general manager of Stone Mountain Scenic Railroad, about his weed control program and he whips out a big smile. He's got every right to smile, because McAfee maintains a weed-free trackside with an effective herbicide program.

16 The Great Mower Debate — Newly proposed power equipment standards may require a computer programmer to operate future mowers if these standards are accepted. James Walker brings us up to date on the Federal Consumer Products Safety Commission proposals.

22 Turf Subirrigation — Technique of Tomorrow? — Subirrigation, a method used mostly in agricultural crops, is being explored for turf irrigation. Jeffrey Krans reports on a recent field study of subirrigation on high maintenance bentgrass turf during prolonged heat stress.

24 Corrosion on a PVC Irrigation System — A situation occurred a few years ago where the copper fittings on a plastic piping system corroded and resulted in severe leakage. Dr. L. W. Gleekman conducted a thorough investigation of the system, soil conditions and installation. He reports here on his findings.

38 Protecting Your Investment in an Irrigation Installation — Contracting an irrigation installation job is tricky business. To protect the sizeable investment involved, author Bob Cloud lists the step-by-step procedures to insure success.

56 A Boost for Water Quality — Inventor Robert Eron is concerned about water quality. This concern lead him to the development of the Eronator, an aerator and water treatment device, which is said to improve water quality in a multitude of applications — sewage disposal plants, lagoons, city water supplies.

60 Big Canyon, An Engineering Marvel — A semi-arid area is converted to a lush 6,800 yard golf course. The turfgrass varieties had to be carefully selected to withstand year around play and high daily temperatures.

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THE COVER — A Hi-Rail truck moves along about 15 miles per hour spraying trackside weeds on Stone Mountain's Scenic Railroad. Background displays the "1880 motif" seen along the track.

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HUGH CHRONISTER
PRESIDENT

ARTHUR V. EDWARDS
PUBLISHER

LEO NIST
SENIOR VICE PRESIDENT

WILLIAM CUNNINGHAM
VICE PRESIDENT, TREASURER

EDITORIAL

DONALD D. MILLER
EDITORIAL DIRECTOR

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ASSOCIATE EDITOR

JEAN A. ROHRER
ASSISTANT EDITOR

CIRCULATION

GILBERT HUNTER
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DIRECTOR OF CIRCULATION

PRODUCTION

PAUL BALTIMORE
DIRECTOR OF OPERATIONS

DARRELL GILBERT
ADVERTISING PRODUCTION MANAGER
9800 Detroit Ave.
Cleveland, Ohio 44102
(216) 651-5500

ADVERTISING

HEADQUARTERS:
9800 Detroit Ave.
Cleveland, Ohio 44102
(216) 651-5500

JEAN NEUENDORF
EXECUTIVE ASSISTANT

DOROTHY LOWE
CLASSIFIED ADVERTISING MANAGER

RICHARD H. SWANK
REGIONAL MANAGER
9800 Detroit Ave.
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. . . or get even greater versatility with any one of six multi-purpose, articulated, rubber-tired trenchers from Vermeer. Photo (above) shows M-440 Trencher with backhoe-blade.

"The Diggin' Dutchman's" big M-50 demonstrates direct burial with 2 in. cable, down to 30 in. deep . . . Features both hydrostatic drive or torque convertor REVERS-O-MATIC.

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Editorial

EPA needs to clear up some gray areas relating to user certification which will suddenly come about in October 1976. The effect of certification hasn't been fully realized by many in the business of supplying and using pesticides.

An early step needed by EPA is an agreement on reciprocity among states. Custom applicators, dealers who do custom work, company sales representatives who do demonstrations, and others many times find themselves working across state lines. Since each state will administer and regulate its own certification program — with standards approved by EPA — a situation is created whereby a commercial applicator will need multiple state certification. Without a reciprocity program, certification can become both costly and time consuming for the individual applicator. Varying standards among states will naturally create a problem in any program of reciprocity but this can and should be solved by EPA.

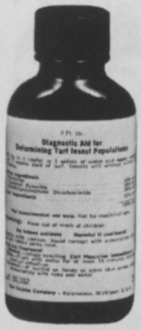
Another area which appears gray is the certification programs being set up by the 50 states. We can't see how this can be achieved without the restricted use pesticide list which is to be supplied by EPA. The list insofar as we know is not ready — and a further burden is shared by those setting up state programs and by manufacturers who would like to develop their marketing programs.

EPA Administrator Russell E. Train, speaking recently to the Weed Science Society of America, stated, "Our role it to ensure that essential and environmentally acceptable pesticide tools are maintained, but that also the benefits of these tools are not at the price of an ecological disaster." We would agree that this mandate is acceptable and simply stated. But its application to the specific pesticide industry and the effect on the nation's best interests are areas which are not so simple.

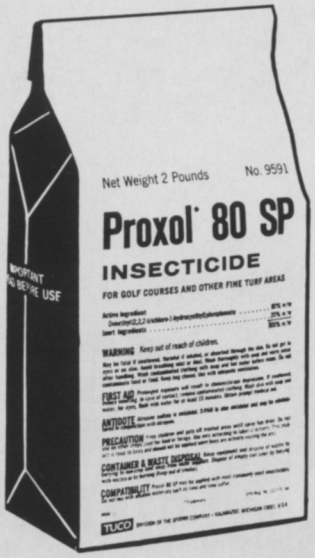
We are anxious for EPA to apply the "get tough" policies and regulations which were first anticipated with passage of amended Federal Insecticide, Fungicide and Rodenticide Act in 1972. Easing off on deadlines and penalties now is a mistake and unfair treatment for good custom applicators and basic manufacturers who have spent plenty of money in getting ready to comply with a stringent program backed by tough penalties. To let shoddy operators slip through because government hasn't fully prepared and clarified a program is unthinkable.

Take the guesswork out of turf insect control

Diagnostic Aid from TUCO



Many turf insect larvae are night feeders, so the first evidence of their activity frequently is damaged turf. Diagnostic Aid, applied to turf as directed, causes insects to emerge to the surface within 10 minutes. They can be identified and counted to determine the level of infestation and whether an insecticide should be applied. It also can be used after insecticide application to measure the control obtained.



Proxol* 80 SP Insecticide from TUCO

Proxol is the one insecticide developed especially for use on fine turf and ornamentals. Sod webworms and cutworms are two major groups of turf insects controlled by Proxol. It is estimated that each sod webworm larva can chew up 20 square inches of turf in its average life span of 20 to 40 days; the cutworm larva can devour up to 36 square inches. With 300 to 500 larvae generated from each adult in a period of 10 to 21 days, it becomes apparent why early detection and control are desirable. Using Diagnostic Aid and Proxol together lets you program insect control.

*Trademark

One bottle of Diagnostic Aid FREE in each case of Proxol 80 SP.

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TUCO Division of The Upjohn Company, Kalamazoo, Michigan 49001

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- TORO'S new 670 head gives you the wide spacing you need for conversion at lowest cost.
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Write today for a complete conversion brochure: TORO Irrigation Division, Dept. W-575, P. O. Box 489, Riverside, CA 92502.

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RAILROAD WEEDS:
One Headache You Can Do Without

Top: **That's the famed sculpture of Jefferson Davis, Robert E. Lee and Stonewall Jackson at Stone Mountain, Ga. The carving is 90 feet tall and 120 feet wide.** Bottom: **Moving along at 15 mph, the truck sprays the entire five-mile track with a residual herbicide eight feet from the center.**

WEEDS ARE a problem in any railroad operation. They obstruct view of the track, hinder maintenance, interfere with equipment, create a fire hazard, and they hold water so it doesn't drain off ballast properly. No matter how many miles of track you've got, weeds are one headache you can do without.

Alexander Hamilton McAfee, president and general manager of the Stone Mountain Scenic Railroad, only has five miles of track to worry about. Not a big problem as far as railroads go. After all, there are more than three million acres of railroad rights-of-way in the country today.

In fact, unless you're a native of the South, chances are pretty good you've never heard of the Stone Mountain Scenic Railroad, or of Stone Mountain, Ga., either. The mountain just happens to be the world's largest solid-granite outcrop, with the world's largest piece of sculpture. The railroad is the largest full-size, standard gauge park railroad in the country.

Both are located just east of Atlanta on U.S. 78, where the mountain rises some 1,683 feet above sea level and around its base some 3,200 acres have been set aside as a state park.

The railroad, considerably newer than the mountain or the sculpture (which was first commissioned in 1915 by the United Daughters of the Confederacy), made its first official passenger run in 1962 and is a railroad buff's dream. The five-mile track circles the mountain, and unlike many other railroad attractions, the equipment is authentic. All of the locomotives are live steam with 4-0-4 wheelbases. The engines and coaches have been remodeled, however, to give them the appearance of railroad equipment in use during the 1880's.

Since that first run, the Stone Mountain Scenic Railroad has carried over three million passengers, and better than 350,000 ride her rails each summer. Ask McAfee about the problems of keeping the track and engines in operation and you'd better have a couple of free hours to listen. Ask about his weed control program, however, and he whips out a big, broad smile.

Any weed can be a problem, but McAfee's special nemesis is kudzu — a hardy Japanese import that will take over everything once it gets a stand. Uncontrolled, it can cover a track in a matter of weeks in the warm, moist Georgia climate. Kudzu, along with mixed grasses and broadleafs, accentuates this problem for the Stone Mountain line. Part of the trip requires the engines to pull a grade, and with a full complement of passengers, a wet track can cause wheels to spin — another hazard. Passenger safety demands such problem weeds be eliminated, and after more than 10 years of trying everything, McAfee finally found the answer last spring.

The answer was 15 pounds of Krovar I weed killer with six pounds of 2,4-D per acre. Krovar I is a residual herbicide. Absorbed through the roots, it moves into the plant's water stream where it interferes with the plant's food producing mechanism. Effective over a relatively long period of time, it reduces the necessity of multiple applications. A broad spectrum product, it is effective against perennial grasses and broadleaf weeds.

The 2,4-D is a selective systemic, and while it has very little effect on grasses, it is effective on broadleaf weeds and woody vines. It knocks out some of the weeds that are up and growing, while Krovar I provides more thorough, longer-lasting control.

And that's exactly what the Stone Mountain line got — effective control. "It's never looked this good," says McAfee, "and we've tried everything we could get hold of."

This was also McAfee's first time

(continued on page 53)

Beautiful turf is no accident. Make it happen with Acti-dione® 4-season disease control

The old saying that beauty is more than skin-deep is nowhere more applicable than on a golf course. Beautiful turf will not retain its beauty unless it remains healthy. In addition to normal wear and tear from golf play and stress from variable weather conditions, fungi are an ever-present health threat to turf. There's little you can do about golf play and weather, but you can control fungal diseases. An effective, economical way to combat fungal growth all year long is to use Acti-dione® Thiram and Acti-dione TGF® in a four-season disease control program. With fungi out of the way, turf has a better chance to grow strong and healthy — to resist weed infestation, to bounce back from injury and to survive adverse weather conditions. See your TUCO distributor today for complete information and assistance in planning a four-season disease control program with Acti-dione turf fungicides.

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Brown patch heads summer diseases

Brown patch is a prime summer threat because it thrives in warm weather. Acti-dione Thiram, applied weekly, controls not only brown patch, but also dollar spot, melting-out, fading-out, leaf spot, rust and powdery mildew.

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Use Proxol* 80SP to help prevent insect damage

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For More Details on Following Page Circle 139 on Reply Card

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Guest Editorial

How Do We Meet the Challenge?

By ROBERT FELIX, Executive Secretary
National Arborist Association

THE CURRENT economy is providing the tree care industry with the biggest challenge that we have ever faced. As disposable income decreases, maintenance budgets shrink and part time "buzzards" become full time competitors our market can and in some instances is dwindling.

The energy crisis has already forced a reduction in budgets for tree trimming by the Utilities in many parts of the country. OSHA and EPA are also doing their part in placing regulatory limitations on our activities. Financially pressed municipalities and institutions are not contracting for the volume of tree care that they have been. Can we adjust or will we be a service of the past?

For some the answer is not even receiving consideration, much less the problem. Others are ready to meet the challenge head on and they will succeed. The days of "I have more work than I can handle" and "I never have enough men" are gone. It is a buyers market and if we wish to remain the viable industry that we can be we have to use every bit of ingenuity that we can.

Management is the key, be it in sales, production, personnel, time, equipment, purchasing or financial matters. To survive in today's economy a tree man must be an astute businessman as well as a professional arborist! Your success will be a result of your willingness to be industrious as well as smart.

Sales are the initial step. The large jobs aren't coming as easily as they used to. The average job is smaller and the buyer is interested primarily in the must items. Therefore every potential job must be sold. You must get your price but you must also endeavor to interest that customer in every possible service that he must have. A weak tree with lots of dangerous dead wood must not only be pruned but fertilized. An insect infested area must be treated. A section of line that is allowed to become overgrown will not only result in "outages" but will cost substantially more to trim in several years.

Your customer list is an extremely important source of new business. Review it frequently. Visit accounts that you haven't serviced recently. These people are accustomed to spending money on their trees. Although they might not spend as much as they did last time, they will certainly consider doing some of the "must" things now.

You cannot sit back and wait for orders to come to you. Go get the business. There is as much in many areas as there ever was. It just comes in smaller pieces. Regardless of the state of affairs do not sacrifice price or quality to sell a job. A job that has no profit is worse than no job at all and a poor quality job will cost you valuable professional image points.

Professionalism is another factor in this battle. Whether you are an owner, a manager, a supervisor or a climber, the man who is the most professional as a tree man and a businessman will prevail. Good tree men who are inadequate businessmen are in for trouble as are good businessmen who provide less than competent tree care service.

Your professional trade associations, Extension Service and trade publications keep you abreast of current developments in technology and in Federal, State and local regulations. Read what you receive and listen to what you hear. If you take advantage of all of the information that is available to you the OSHA man and becoming a Certified Commercial Applicator will not be difficult. For the truly professional tree man these regulations will help rather than hinder, with some exceptions.

Plan your time and use it profitably. Wasted motion is needless exercise that doesn't buy steak! Depending on your responsibilities emphasize those areas which will result in the most benefit for the company. You can't afford to sit still.

Management must stay on top of expenses, accounts receivable and eliminate non-productive overhead. Let the demand determine the need. Work closely with your accountant. You don't have the margin available for too many errors. Set an example for those who work with you. If you show an interest in an area your associates will.

We can meet the challenge if we want to. The tree care industry has always been symbolic of the rugged individualism that this country was founded on. Today this rugged individualism must be applied not only up in the air but on the ground and it must be coupled with good judgement! □

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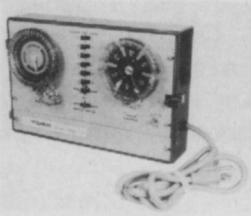

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Now, you can also choose from 3 NEW Models:

- **Model 5106N — with Rapid Advance — no delay between zones.**
- **Model 5112 — 12 zones, with Rapid Advance**
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Government News·Business

Appraisement (setting trade value) is being withheld by the U. S. Treasury Department from some electric golf cars imported from Poland pending an investigation. This investigation is to determine if the cars, imported into the country by Melex U.S.A., Inc. are being sold in the U.S. at less than fair value. If it is decided by June 14 American manufacturers have been injured, the International Trade Commission will conduct a three-month investigation scanning the U.S. market for golf cars. If the ITC decides the golf cars are being sold at less than fair value, a duty will be charged on all Melex golf cars brought into the country since March 14, the date of the withholding action. The ITC decision would come on or before September 14. The investigation stems from a complaint made March 14, 1974, by Cushman Motors Div., OMC Corp., manufacturers of Cushman golf cars.

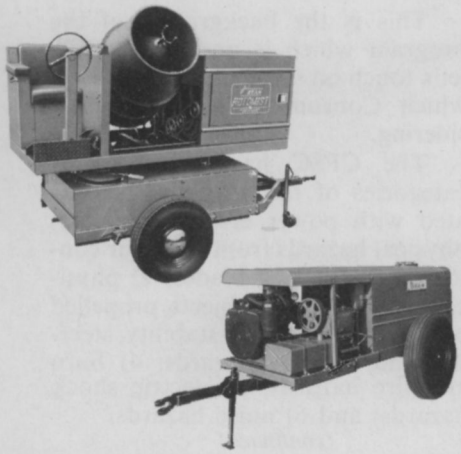
OSHA has developed a self-teaching course in the principles and practices of on-the-job safety for first-line supervisors. The course consists of an administrator's manual that provides instructions to the person who will administer the course, plus six booklets containing 14 lessons. The format of the course is based on a programmed instruction technique in which students, using course materials, teach themselves. Entitled "Principles and Practices of Occupational Safety and Health - A Programmed Instruction Course," the booklets may be ordered from the U.S. Government Printing Office, Washington, D. C. 20409.

Rebates reached the Green Industry when International Harvester announced a nationwide direct sales rebate to retail customers of most industrial equipment models. Pay Line Division Marketing Vice President, J. L. Adams said the program will serve a two-fold purpose: "First, it will increase the cash flow in the economy, both national and local, and second, it should more firmly establish Pay Line Division's already strong position in the highly competitive industrial equipment market." Rebates vary from $300 to $1,500 depending on the price of the unit for a three month period, effective April 1, 1975.

Pioneer Chain Saws will move into a 160,000 sq. ft. manufacturing facility in Peterborough, Ont. this spring. Thomas P. McMillan, president of OMC Corp. of Canada, Ltd., said the facility will augment chain saw production in the main 500,000-sq. ft. facility already in Peterborough. He said the combined plants will enable Pioneer to double its production capability.

OSHA boss, John H. Stender, recently announced a program to more actively involve states in the development of workplace safety and health standards. Stender said OSHA will send draft standards to certain states for their review and comment before OSHA proposes them for public comment. States with OSHA-approved plans for their own job safety and health programs, may participate on request and also may participate during public comment periods on final proposals. Interested states will be sent copies of standards drafts as they become ready for technical review.

Seasonal leaf drop is one thing...



. . . but loss of leaves through bark and leaf infestation is quite another. To protect your shade trees from disaster, a well-planned spray program is well worth the time it requires — and FMC spraying equipment is the best way to go. FMC's Rotomist® controlled-air sprayers for example, are specifically engineered to give you maximum penetration and assure you the best possible coverage and protection. FMC's line of high pressure sprayers also afford you the versatility and performance you need...are available skidmounted or in trailer models, with hose and gun for effective shade tree applications. You won't find any better tree protection than with FMC sprayers. Contact your nearest FMC representative for a demonstration today, or write the FMC Corporation, Agricultural Machinery Division, Jonesboro, Arkansas 72401.

FMC Environmental Equipment

For More Details Circle (132) on Reply Card

The Great Mower Debate

By JAMES C. WALKER, Outdoor Equipment Co., St. Louis, Mo.

Newly proposed power equipment standards will drastically alter existing mower designs if accepted. But what will they do to present cost and repair factors? And will we be able to live with them?

Background

Last July, the Federal Consumer Products Safety Commission (CPSC), a five-member group empowered to set safety standards on a wide range of consumer products, published a Section 7(B) Notice in the Federal Register that "certain hazards associated with the use of power lawn mowers present unreasonable risks of injury to the public." Publication of a Section 7(B) Notice is the method used by CPSC to notify an industry that its products are considered dangerous.

The Notice was pretty much of a surprise to the Outdoor Power Equipment Institute (OPEI) whose members produce about 85 percent of all turf and grounds maintenance equipment in use today. The OPEI, which has been developing safety standards since the mid 1950's, carefully followed CPSC's procedures in submitting necessary documents in the hope that it would be selected to establish new safety standards. With 14 years experience in safety programs and a firm foundation of the American National Standards Institute specifications, OPEI assumed this work could be continued and desired results could be achieved in the prescribed time and at minimum cost.

However, the hand of the federal government intervened and by a split decision, CPSC designated Consumer's Union to develop the proposed standards because they "wanted to involve the consumer and Consumer's Union could better accomplish this."

Consumer's Union, a non-profit organization best known for its publication of the monthly magazine *Consumer Reports,* received a $90,000 grant from CPSC to develop the standards. A 20-person committee was formed with Bertram Strauss as chairman. There are four or five committee members who have firsthand knowledge of the power equipment industry. Among the other members are three engineers, an economics professor, an attorney, two persons from major retail chains, a surgeon and several consumers "having substantial experience with power lawn mowers."

Consumer's Union was given 90 days to develop the safety standards and present their proposal to CPSC. On Dec. 24, 1974, CPSC granted a six-month extension and an additional $90,000 for the development of the mandatory standards. The final proposal must be delivered on June 19, 1975, and it is proposed that the standards will be mandatory on all 1976 production.

This is the background of the program which is underway. Now let's touch on some of the proposals which Consumer's Union is considering.

The CPSC has identified six categories of risk of injury associated with power lawn mowers: 1) physical hazards from operator contact with rotating blades; 2) physical hazards from objects propelled by rotating blades; 3) stability, steering and braking hazards; 4) burn and fire hazards; 5) electric shock hazards; and 6) noise hazards.

(continued)

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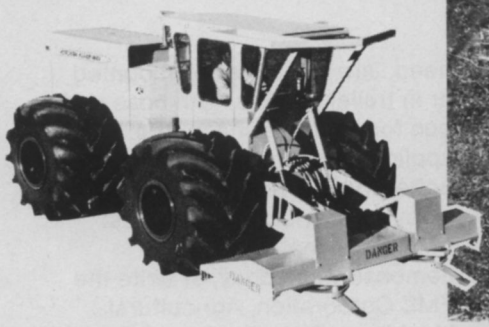

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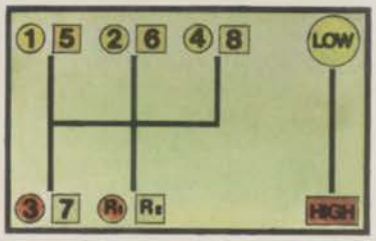

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DEBATE *(from page 16)*

Operator Contact

Regarding the hazards associated with operator contact with the blades, Consumer's Union is proposing the following standards:

* Power lawn mowers shall have a deadman's control to stop the blade within two seconds if the operator leaves operating position without stopping the engine. This is to be accomplished by a special clutch and brake combination inserted between the power source and the cutting mechanism.

* There shall be a means to automatically prevent the motor from starting if the deadman's control should become permanently actuated. This requires an electronic sequential sensing mechanism requiring a period of no actuation of the deadman's control before the engine can be started.

* The deadman's control shall be "fail-safe" with failure of any part of the system resulting in stoppage of the blade. This proposal calls for a spring-loaded blade-clutch brake automatically applied if the control becomes damaged.

How would you like to fix that one in the service shop?

Also proposed is an interlock which will permit blade rotation only when the mower is moving forward, causing blades to stop within two seconds when the mower is shifted to neutral or reverse. Can you visualize this device when you're in a tight area and are trying to do a little trimming?

Consumer's Union is also proposing that a riding mower or lawn tractor have a means on each side to:

* Prevent an operator's foot from touching the ground within the width of the cut swath, or between fore and aft lines tangent to the blade shielding or the outermost tip of the discharge chute, whichever is greater;

* and to prevent an operator's foot from being trapped between a wheel and any other part of the mower while the user is in the operating position.

The suggested solution calls for fenders and running boards which extend beyond the outer limits of the blade housing and discharge chute and follow the contour of the wheels to the point beyond the highest point on the wheel. This really presents an interesting picture on a Jacobsen F20 tractor mowing a 21-foot swath, or even an 88-inch rotary. It resembles the flight deck of a nuclear aircraft carrier.

Propelled Objects

To reduce the energy and range of thrown objects, the proposed maximum tip speed of the blades shall be 15,000 feet per minute. Two years later, maximum tip speed shall be reduced to 12,000. The typical small engine today is horsepower rated at 3600 RPM. Engines will have to be redesigned to produce maximum torque at lower RPM. Suddenly, we find ourselves caught up in complete design revisions with more multi-blade units, larger horsepower engines and complicated drive mechanisms because we no longer develop the torque necessary to obtain performance, particu-

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larly with the large sized single blade machines. This problem **can** be effectively solved by shielding, so it seems unnecessary to accept this standard.

Stability Hazards

Regarding stability hazards, Consumer's Union is suggesting the following standards:

* a riding mower shall not tip on a 30-degree slope or the steepest slope it is able to climb, whichever is greater;

* a riding mower shall emit a continuous audible warning sound when the mower is tilted to an angle five degrees from the limits of stability;

* a red flashing warning light will turn on to warn hard-of-hearing operators that the mower is tilted to an angle five degrees from the limits of stability;

* a power lawn mower shall have an interlock to stop the engine and halt the blade in the event of tipping beyond the limits of stability. This interlock shall function when any pair of wheels leaves the ground.

If you have ever been involved with servicing interlocks, you will realize that everything outlined above will require electronic circuitry far beyond our ability to trouble shoot in case of failure. It is frankly admitted by the engineering group studying the proposed interlock that individual wheel sensors with the programmable sequencing required to accomplish this interlock system are far beyond their abilities to design, and will require a minicomputer on the unit to accomplish the specified results.

Other Proposed Standards

Another proposed standard would require a riding mower to have a weight sensitive control in the seat which would cause the engine to stall when shifted to forward or reverse unless the control is actuated by a weight of 65 pounds or more on the seat. The purpose is to protect children "who have been know to go joy riding" and is a substitute for mother's supervision. This standard would require an anvil on the seat to negate the effect of the interlock when the mower is in the service shop for engine work.

To reduce fire hazards, it is proposed that the fuel cap remain locked and incapable of being removed until engine and exhaust temperatures are below 250 degrees F., and the cap be provided with an interlock to stop the engine when the cap is removed. Here's another program for the mini-computer.

Burn hazard proposals specify that any surface used for lifting, holding or carrying shall not attain a temperature higher than 105 degrees F. Any other surfaces (including the muffler) that may be contacted casually in normal use, or that may be contacted accidentally by the user or bystander shall not attain a temperature higher than 131 degrees F. This standard should not be difficult to comply with in Siberia in the winter, but try it in the Phoenix desert area where there were more than 100 days of 100-degree or higher temperatures last summer.

The proposals covering braking hazards are so broad and so many brakes are required that it is doubtful if you could ever get the mower going in the first place.

Unanswered Questions

The obvious question going through your mind is "How does all of this affect me as a professional in the turf and ground maintenance field?"

In November, 1974, I attended a meeting of the special OPEI Engineering Forum on Lawn Mower Standards as an observer. Represented at the meeting were the OPEI, Consumer's Union, CPSC and engineering representatives of major mowing equipment manufacturers. I was the only distributor or end user of the products under discussion in attendance.

Prior to the meeting, I was under the impression that safety standards were being discussed to be incorporated into the typical homeowner rotary mower, whether riding or walking. As the proceedings unfolded, it became apparent that most of the people in attendance were of the same opinion, with the exception of the Consumer's Union and the CPSC representatives.

In order to clear up the scope of the standards, I proposed two questions to the Consumer's Union: 1) Do you make any distinction for your proposals between homeowner and commercial or professional equipment? 2) Do you make any distinction between rotary and reel type mowing equipment?

No attempt was made to answer either question, and the CPSC representative also declined to answer.

The attorney for the OPEI repeated the question to the CPSC representative who again declined to answer. At this point he attempted to answer the first question by giving the following example. If a piece of equipment is used in the maintenance of schoolgrounds, then it involves the children's safety, and if it involves the children's safety, it probably will be interpreted as within the realm of the CPSC. This approach leads us to parks, golf courses and to the ultimate conclusion that all rotary mowers will be covered. The question pertaining to reel versus rotary equipment was resolved in the same manner by saying that if a stability standard is developed, it will be applied by the CPSC across the board to all equipment.

What I am saying should not be construed in anyway as indicative that the OPEI, the equipment manufacturers, or any of us in the power equipment industry are opposing any measures which will make our products safer to use. We welcome any performance standards that will make our equipment cut grass better, cut grass safely and cut grass at a reasonable cost.

What we do not want is arbitrary standards similar to some of those which have been imposed on the automobile industry to protect drivers from their own foolishness, and which result in increased product cost beyond the benefits derived.

There are three elements of hazards in the grounds maintenance business with which we must contend: the product, the operator and the environment.

It is our job to recognize an unreasonably and inherently hazardous product and discontinue its use.

It is our job to train, train and retrain our operators and mechanics in safety.

It is our job to know the environmental limitations to the use of a piece of equipment and use it only in those areas where it is safe for the operator and safe for bystanders. Performance standards that are reasonable are not objectionable, but the design of the equipment must be left to the manufacturers. □

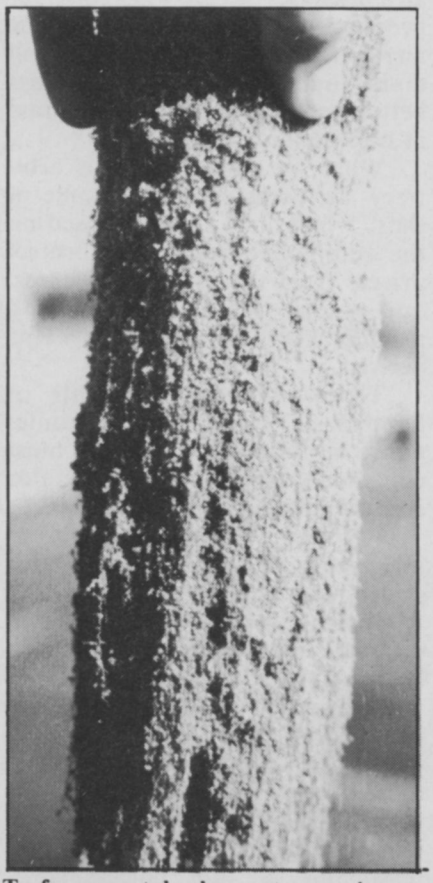
Turf Subirrigation — Technique of Tomorrow?

By JEFFREY V. KRANS
Turfgrass Extension Associate
Michigan State University

SUBIRRIGATION involves the application of water to the plant from beneath the surface. This method of irrigation supplies water for root uptake by capillary action and avoids wetting the soil surface.

Subirrigation has been shown to minimize soil compaction and reduce water usage resulting from excessive surface evaporation and runoff. The most common methods of subirrigation provide water from either: a) a constant or fluctuating water table, or b) perforated tile.

The constant or fluctuating water table system is employed by surrounding a localized area of soil with an impermeable barrier and maintaining a water table above the barrier at a desired level beneath the soil surface. This system requires that the distance between the soil surface and a level plane of the barrier be maintained constant for uniform water distribution.



Turfgrass root development was quite extensive on the subirrigation plots with a fluctuating water table.

The perforated tile method involves burial of plastic pipe or tile beneath the soil surface usually to a depth just below normal root penetration. This system supplies a specified amount of water to replenish the soil moisture reservoir, but at a very slow rate to minimize seepage loss below the root zone. Clogging of the tile and lack of uniform distribution are common problems.

The use of subirrigation has usually been limited to areas with naturally occuring high water tables. These areas are mostly in agricultural crops with the exception of some commercial sod production on organic soil. Few studies have been reported on the use of subirrigation for turf.

Early research was conducted at the University of Arizona using perforated plastic pipe.[1] They showed that subirrigation can be managed to provide good bermudagrass turf with water use similar to sprinkler irrigation.

The PURR-WICK root zone system has been developed and successfully used for irrigation of recreational turf in a temperate climate.[2]

A recent field study was conducted at the University of Arizona to evaluate the merits of subirrigation on high maintenance bentgrass turf during prolonged summer heat stress.[4] Some of the more important aspects of that work are presented herein.

Treatments included a conventional sprinkler irrigation system, subirrigation with a stable water table 12 inches below the soil surface, and subirrigation with a fluctuating water table. The fluctuating water table ranged between five (after subirrigation) and 20 inches (after depletion). Two artificial soils were used: a) a 52 percent sand, 24 percent loamite (a product formerly processed from wood by the Loamite Corporation, Santa Rosa, Calif.), and 24 percent sandy clay loam soil mixture; and b) an unamended washed mortar sand. Nitrogen was supplied by dissolving ammonium sulfate in the irrigation water before it was applied for each of the subirrigation methods.

Color, Growth and Root Development

In general, turfgrass growth on subirrigation using a fluctuating water table was similar to sprinkler irrigated plots and superior to turf produced under subirrigation with a stable water table. Turf color, as measured by chlorophyll content, was noticeably darker green on sprinkler irrigation treatments compared with both methods of subirrigation treatments. Root growth and development was measured at the end of the summer and revealed that subirrigation treatments with a fluctuating water table had the greatest amount of root development; subirrigation with a stable water table produced less root development; and sprinkler irrigation had the poorest root development.

Overall, the summer evaluations indicated that the major contribution of subirrigation and fertilization were that root development was noticeably greater and the turf did not require periodic syringing on hot windy days. The major disadvantage associated with subirrigation and fertilization practice was a lighter green turf, especially on subirrigation treatments with a stable water table. Salt accumulation on subirrigation treatments did not build up to detrimental levels. Overall, the sand and mix showed similar growth and color characteristics. Root development, however, was significantly greater on the sand than mix.

Nitrogen Fertilization

Turfgrass color on subirrigated treatments showed typical symptoms of nitrogen deficiency. Tissue analysis of leaf material revealed nitrogen content on subirrigation treatments significantly lower than sprinkler irrigated plots. These lower nitrogen levels on subirrigation treatments were comparable to tissue nitrogen levels of sprinkler irrigated bentgrass at the onset of nitrogen deficiency under similar temperatures.[3]

(continued on page 48)

Tree Wounds and Decay

A Talk With The Expert

By WALTER E. MONEY, Guardian Tree Experts

Recently, members of the Maryland Arborist Association visited Dr. Alex Shigo, plant pathologist with the U.S. Forest Service, at the Northeastern Forest Experiment Station in Durham, N.H. In two successive one and one-half day seminars, the arborists were able to go into a detailed study of the decay process associated with wounding in trees.

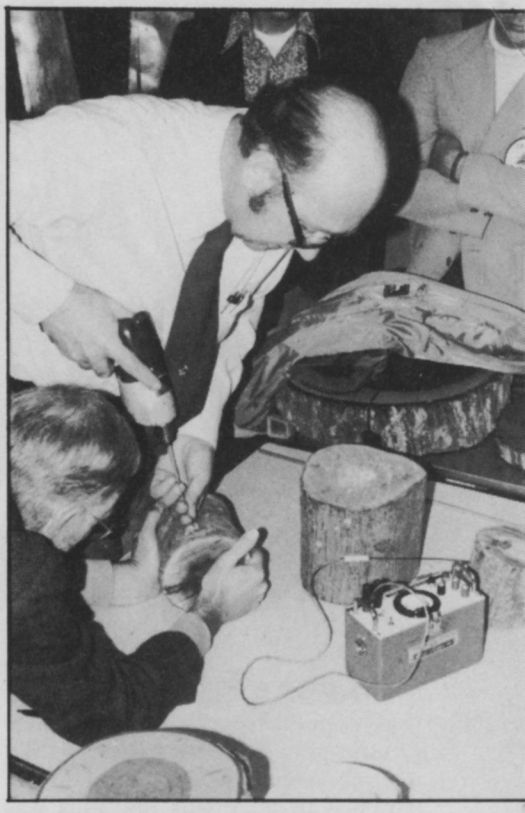
Shigo used a host of specimens that he has collected over the years to punctuate his explanations that wounds are the number one problem of trees — even Dutch elm disease begins with a wound by the feeding of the elm bark beetle — and that trees attempt to compartmentalize or seal off a wound and heal themselves over a period of time. His detailed descriptions that proper pruning and fertilizing are several of the key ingredients in this healing process were the dollars and cents ideas that the tree experts were able to take home with them.

Dr. Alex Shigo explains to Walt Money of Guardian Tree Experts why proper pruning of old stubs is so critical in the healing process of trees.

Throughout the discussions, Shigo was able to logically, and with strong evidence, shoot holes into some of the "sacred cow" ideas that have come down to tree men over the years, such as: a second growth stump sucker is not supposed to be trusted to become a structurally sound, mature tree. However, under certain circumstances, this tree should be as safe as a tree grown from seed. Also, that it probably would hinder rather than help a tree to flush cut the heal callous of an old stub that had almost healed and thereby break the natural barriers that the tree has set up to control decay.

The need for proper pruning was emphasized in that poor pruning and jagged stubs act as a "wick" to carry infection to the center of the tree, and that judicious pruning and feeding can be analogous to "immunization" shots to help a tree better withstand more severe shocks to it system, such as wind and ice breakage.

The one- to two-hour programs that Shigo has presented on this subject around the country have not been long enough to go into what many professional arborists consider to be some of the most exciting information to hit their industry in many years. For this reason, the "mountains went to Mohammed" in New Hampshire for a more detailed program. Of particular benefit to men who make their livelihood from the care of shade trees were the ideas that they took home to use in formulating more logical sales presentations to tree owners.



Ed Hogarth steadies a tree section as Alex Shigo drills a small hole in preparation for a demonstration of the "Shigometer," an electrical probe that can measure the advance of decay in a living tree.

In a day when we are more aware than ever of government programs and spending, it is refreshing to know that the Forest Service is an agency that returns more revenue to the treasury by the management of our forests than it spends to maintain itself. Many more questions remain to be answered, but we are sure that with gifted researchers such as Shigo, and with the positive attitude displayed by the Forest Service, we are on the way. □

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Corrosion On a PVC Irrigation System

By DR. L. W. GLEEKMAN, Materials and Corrosion Engineering Services, Southfield, Mich.

A two and one-half inch ips male thread-to-tubing nipple.

ONE WOULD ordinarily think that copper fittings on an underground plastic piping system would not corrode; there is much experience to back this up. This was not the situation, however, in an automatic sprinkler system installed several years ago in the community center of a major city in Michigan where an abnormal situation resulted in leaking at the copper fittings.

The installation involved copper fittings in conjunction with automatic brass valves and plastic piping on the main and lateral runs. Back flow prevention was provided consisting of line size vacuum breakers on the discharge side of each zone control valve.

The underground specifications called for sizes two-inch and smaller being flexible, non-toxic plastic pipe made from 100 percent virgin polyethylene with a minimum 80 psi working pressure. All stainless steel clamps were to be used to secure the joints. Joints one inch to one and one-half inches and larger were to be double-clamped. All plastic pipe was to be continuously and permanently marked with the manufacturer's name, material, size and schedule or type; pipe conformed to PE 2306-Irrigation pipe. Sizes two and one-half inches and larger were to be virgin high-impact polyvinylchloride pipe with a minimum 125 psi test; pipe was to conform to ASTM C-178-60T. Pipe fittings were to be either copper pipe with wrought solder fittings or flexible polyethelene fittings on automatic drain and underground branch line only. PVC solvent weld fittings were also allowed.

Other details of the manual valves, remote control valves, automatic controllers, valve boxes, drains, and so on, are not germane to the ensuing problem.

At the time the investigation started, the system was approximately a year old, and was buried in soil not considered overly aggressive. However, in a short period of operation, leakage was found at several of the copper fittings on the underground systems. City officials and others involved in the problem immediately began to look for such things as electrolysis, stray currents from nearby radio transmitters or unusual soil conditions. The water used for sprinkling was city water.

When the investigation of the cause of corrosion started, three threaded copper adaptor pieces were received. The pieces may be described as follows:

- Small piece, two and one-half inch ips male thread-to-tubing nipple with a short length of two and one-half inch copper tubing attached by a soldered joint.
- Medium piece, two two-inch ips male thread-to-tubing nipples joined together to a short length of two inch copper tubing by soldered joints.
- Large piece, two-inch ips male thread-to-tubing nipple soldered to a piece of two-inch tubing, in turn soldered to a two-inch to one and one-half inch reducing bushing, soldered to a piece of one and one-half inch tubing.

The small piece showed attack at only one area in the threads; this was located three threads back and was slightly oval in shape. Sand was present in the threads on most of the piece, indicating that no more than three threads had been properly engaged.

The medium piece showed the largest amount of attack. There was a large section chewed out of the threads on one end with the adjacent threads attached. The octagonal shanks of the fitting were worn smooth right down to the solder in one area. The other threaded end was perfect, with the first four threads clean and shiny showing full engagement; the remaining six threads had a visible trace of a blue compound plus very definite grains of sand in many of these threads. On the attached end, from the color of the threads and the location of the sand in the threads, it was very evident that no more than two threads had been fully engaged.

The large piece had been coated after removal with a blue PVC joints cement over a large part of the threads. Thus, the presence of sand and gradations in color would not be clearly differentiated. However, the location of attack was, at one

(continued)

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CORROSION *(from page 24)*

point, in the threaded portions of the nipples.

Metallurgical examination was carried out by removing sections from both small and large pieces. The microstructure was normal for drawn copper fittings with no signs of metallurgical contaminants such as copper oxide. The structure of the attacked areas was the same as the unattacked. There was no sign of pitting, stress corrosion, intergranular corrosion attack, and so on. Chemical analyses were not run since metallographic examinations showed no abnormal phases nor were specifications on the copper fittings spelled out to allow any comparison.

Examination at low magnifications (three to 15 times) clearly showed the nature of the attack. The medium piece showed the greatest attack and the clearest differentiation of the mechanism. The maximum attack in the threads started at the inner end of the thread and progressed back six threads at one location. The attack was characterized by overlapping shallow depressions in both the root and the top of the threads as well as along the sides of the thread. There was a definite clockwise orientation to the attack in the direction of the right-hand thread. This was characteristic of the attack on all threaded joints. Downstream of the attack area there was no attack. The hole in the medium piece, which was elongated transversely to the length of the tubing and nipples, was in direct line with the eroded portion of the shank of the two nipples.

There was no sign of attack on the interior of the tubing or fitting and the hole clearly proceeded from the inside outward. The surface of the tubing and the nipples showed an exceptionally smooth wear pattern and with no grooves or scratch marks. Obviously, the copper wall of the tubing had been worn by external erosion of escaping water to the point where it could no longer withstand the internal pressure; the tubing then ruptured.

Dr. Mars Fontana of The Ohio State University, the senior author of "Corrosion Engineering" (McGraw Hill, 1967), lists eight forms of corrosion and the factors causing each type of corrosion on copper. Two additional types of corrosion have been added since they are corrosion caused by environmental conditions.

Examination of the pieces and description of the corrosion allows the conclusion to be drawn that the corrosion was NOT:

1. Uniform—The attack would not have been uniquely located in just a part of the threads if the soil were corrosive and would have been found inside the tubing if the water were corrosive.

2) Galvanic—So far as is known, copper nipples were not in contact with cast iron or passive stainless steel or graphite; in addition, attack would have appeared entirely around the threads.

3) Crevice—Again, the attack would have appeared entirely around the threads in all crevice areas and not just a small area.

4) Fitting—The attack would have been more evenly spread over the threaded area without the unique orientation found.

5) Intergranular—No attack was seen at grain boundaries on metallurgical examination.

6) Selective leaching—No such attack was seen on metallurgical examination nor was there a second element present in the copper for such an attack.

7) Stress—Metallurgical examinations showed no stress corrosion cracking (the pieces were in the annealed condition).

This is the medium piece — a two inch ips male thread-to-tubing nipples joined together to a short length of two inch copper tubing by soldered joints.

8) Soil—Attack would have been on the exterior of the copper pieces and not uniquely in the threads.

9) Stray current—Attack would have been localized on certain portions of the exterior and not in the threads.

The corrosion of the copper fittings is traced to cavitation corrosion in the threads, followed by erosion-corrosion of the exterior of the shank of the two nipples and the tubing joining the nipples ("medium" piece).

The fact that sand and blue "thread cement" were still visible on all but the first two or three starting threads of the nipples establishes that there were insufficient threads in contact. The on-off operation of the sprinkler system with the fluctuating pressure from zero to full line would then cause cavitation to progress along a path of seepage of water to the exterior. This would account for the clockwise orientation of the attack and the roughened appearance of the attack.

(continued on page 50)

Knox Fertilizer bags it!

NITROFORM*
organic nitrogen
The nondusting slow-release nitrogen that provides uniform coverage in any kind of spreader.
STH75-4BR

HERCULES INCORPORATED
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GRAVELY® believes you should spend your time working on your grounds, not on your tractors.

All-Gear Drive . . . no belts to slip or break; direct, positive power to wheels and attachments.

Instant Forward-Neutral-Reverse . . . for precision control in the tight spots. Just flip the lever to stop and change direction.

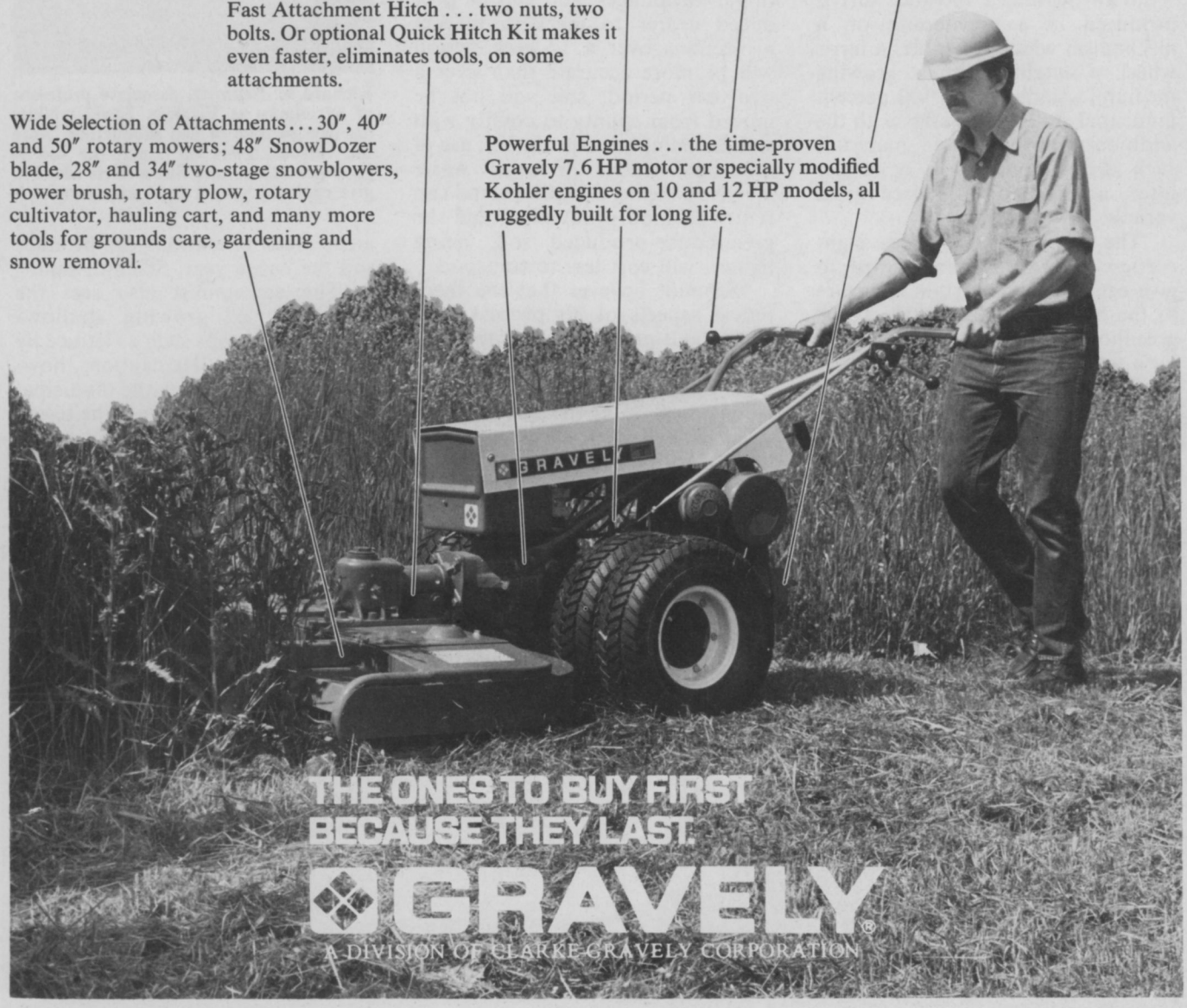
Swiftamatic, 4-Speed Transmission . . . standard on 7.6, 10, 12 HP tractors, can reduce ground speed by half while attachment speed remains the same. Rugged transaxle, planetary type transmission.

Converts to Rider . . . optional steering sulky attachment lets you ride for the long runs on tractors equipped with optional Dual Wheels.

Fast Attachment Hitch . . . two nuts, two bolts. Or optional Quick Hitch Kit makes it even faster, eliminates tools, on some attachments.

Wide Selection of Attachments . . . 30″, 40″ and 50″ rotary mowers; 48″ SnowDozer blade, 28″ and 34″ two-stage snowblowers, power brush, rotary plow, rotary cultivator, hauling cart, and many more tools for grounds care, gardening and snow removal.

Powerful Engines . . . the time-proven Gravely 7.6 HP motor or specially modified Kohler engines on 10 and 12 HP models, all ruggedly built for long life.



Write for free catalog... GRAVELY., 3505 Gravely Lane, Clemmons, N. C. 27012

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'Ferris Wheel' Sod Production Could Revolutionize the Industry

A NEW METHOD of sod production which could conceivably revolutionize the industry has been developed by Richard E. Schmidt, associate professor of agronomy at Virginia Polytechnic Institute and State University.

Under traditional sod production methods, land is prepared and seeded to the desired turf varieties. It takes two years before a marketable turf is produced.

With Schmidt's method, turf is produced in a greenhouse on a mechanism which resembles a ferris wheel. Containers of a growing medium, usually either 100 percent municipal sludge, or sludge with the addition of other waste materials such as hog hair, fly ash, or broiler litter, are seeded to desired grass varieties.

The ferris wheel rotates eight carriers through a cycle timed to give each carrier a certain exposure to the best lighting available in the greenhouse. The device is operated by a time clock and the rotation is continued throughout the day and stopped at night. Watering is done automatically by a solenoid controlled by the time clock.

Schmidt figures conservatively that his method will produce sod 25-fold over the present conventional method. With his apparatus, he can produce four crops of sod per year and can stack them via his ferris wheel to give a multiple of four over a single flat area in the greenhouse. Then, it should be remembered that these figures are for one year's production versus the two years for conventional production methods.

In addition to more efficiency of production, Schmidt lists these additional advantages: sod can be produced nearer to markets; market projections over a 12-week period will be more accurate than over a two-year period; soil will not be moved from county to county with sod, lessening weed problems; use of municipal sludge or other waste materials means that prime land can return to food production; and the greenhouse-produced sod, being lighter, will cost less to transport.

Schmidt believes that the theoretical aspects of his process have proven out and now risk capital of about $60,000 is needed to build a pilot operation to prove the commercial aspects of the system.

If the system performs as he believes it will, it would be possible for a sod producer to have small operations near large metropolitan areas. Such operations can produce sod the entire year, Schmidt said.

Richard E. Schmidt, associate professor of agronomy at Virginia Tech, exhibits his new method of sod production. Note the various levels on which the sod is grown, which revolve like a ferris wheel to give each the proper light exposure.

The agronomist also sees the possibility of growing shallow-rooted food crops such as lettuce by his new method. He cautions, however, that in this case, the municipal sludge used would have to be tested against the presence of heavy metals or other harmful ingredients.

A patent is pending on the new products, Schmidt said.

Northern California Turfgrass Council's new president, Grady L. Simril (right) of East Bay Regional Park District, accepts a certificate of merit from outgoing president, Paul J. Albright, Jr., of Berger & Plate.

Turfgrass Council Elects Officers

Grady L. Simril, horticultural specialist with the East Bay Regional Park District in Oakland, Calif., is the new president of the Northern California Turfgrass Council, succeeding Paul J. Albright, Jr. of Berger & Plate seed company in San Francisco.

The Council consists of some 325 members in Washington, Oregon and northern California, including commercial suppliers, landscape contractors and architects, horticulturalists, and administrators of city and county parks, golf courses and campuses.

Other officers are: G. S. Sandhu, first vice president; Phil Wyatt, second vice president; and Richard Perona, secretary-treasurer.

The Board of Directors of the Council includes Albright, John Deming, John Dovic, William Patterson and Richard Harrison.

People on the Move

Christopher Senske, elected vice president of Weed And Pest Control, Inc., Spokane, Wash.

* * *

John Y. Morris, promoted to residential-commercial marketing manager for The Toro Company's Irrigation Div.; **Michael H. Small,** promoted to regional sales manager for the western states for the Div.; and **Ken Larson,** appointed group director of manufacturing for Toro's Outdoor Power Equipment Group.

* * *

James Yowell, appointed division manager for The Bishop Company's Country Club brand of turf fertilizers. Bishop Co. is a division of Lebanon Chemical Co.

* * *

The Agricultural Div. (formerly known as Chipman Div.) of Rhodia Inc. announced the following appointments: **John B. Clapp, Jr.,** vice president and general manager of the Div., appointed vice president, Agricultural and Animal Health. **Dr. Louie T. Hargett,** former director of Product Development, named general manager of the Div.

* * *

Norman Rivkees, appointed group vice president, sales, for Melnor Turf Irrigation, a subsidiary of Melnor Industries.

* * *

David J. Arenberg, appointed to the faculty of the University of Illinois' new school of Environmental Management, and will be in charge of the Horticulture Dept. Arenberg is a consultant to many governmental agencies and manufacturing firms and serves on the board of directors of Agro Chem, Inc. and other agencies and companies.

* * *

Frank J. Spalluzzi, appointed corporate director of Management Information Services, American Garden Products, Inc. (ASE).

* * *

Charles Johnson, appointed area salesman for the Delaware, Virginia and Maryland marketing area for Lofts Pedigreed Seed, Inc.

* * *

J. Nelson "Nels" Hoffman, appointed vice president of Sales and Marketing for R & G Sloane Manufacturing Co., a producer of plastic pipe and pipe fitting products.

* * *

Bill Howlett, joined the Lawnseed Dept. of Berger & Plate Co. He will be in charge of marketing and sales of seed and soil conditioner in southern California.

* * *

Roderick Macdonald, joined Thompson-Hayward Chemical Co. as field research and development representative.

* * *

Howard L. McPherson, appointed vice president, operations, Jacobsen Manufacturing Co., and will be responsible for manufacturing operations at all five of the company's plants.

NEW! AQUAPROBE

Sub-Soil Moisture Tester

AQUAPROBE takes the guesswork out of soil moisture testing. Scientifically measures moisture at depths from 2 to 26 inches. No digging; no fixed point of measurement. Amazingly light-weight, portable and easy to use. Aquaprobe is low in cost, too. Write:

HOWARD S. CRANE, INC.
Oneida, N.Y. 13421

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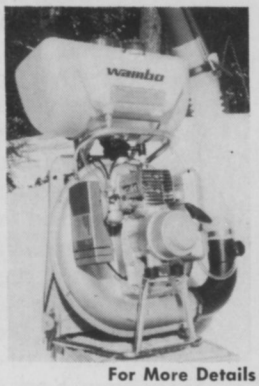
SAVE!



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LIGHTWEIGHT KNAPSACK SPRAYERS AND BLOWERS

270 MPH AIR BLAST
SPRAYS TO 40 FEET

QUALITY & PERFORMANCE WILL DELIGHT YOU

PRICES WILL AMAZE YOU

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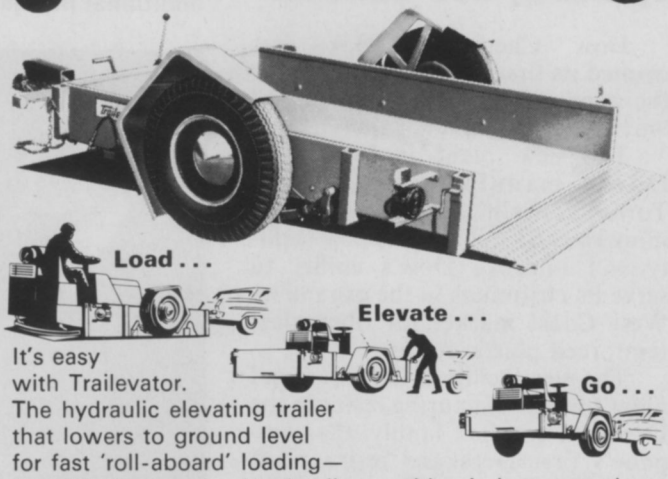
One Manhandling



It's easy with Trailevator. The hydraulic elevating trailer that lowers to ground level for fast 'roll-aboard' loading—then lifts its own load to hauling position in just seconds Handles loads up to 3,000 lbs.*, lifts and lowers without uncoupling from the towing vehicle. Standard trailer hitch quickly attaches to car, truck or tractor. Try a one-man Trailevator. It'll make you a one-trailer man.

Magline, Inc., Pinconning, Mich. 48650, P.O. Box 263

*Other Models to 5,000 lbs.

®TRAILEVATOR
The Hydraulic Elevating Trailer

For More Details Circle (109) on Reply Card

Industry News and Newsmakers

James B. Beard, professor of turfgrass science with the Department of Crop and Soil Sciences, Michigan State University, has accepted a turfgrass research position at Texas A & M beginning June 1, 1975.

West Coast Derakane Plant Opened by Dow Chemical

Dow Chemical U.S.A. has opened its first West Coast plant for the production of Derakane brand vinyl ester resins.

The new plant is located at Dow's manufacturing site in Torrance, Calif. Built at a cost of more than $1 million, the new facility will improve Dow's ability to serve its customers in the expanding West Coast market for fiber glass reinforced plastic resins.

The new facility is Dow's second plant for manufacturing resins in the Derakane product family; the company's first Derakane resins plant opened in Freeport, Tex., in 1967.

The Derakane products are used in manufacturing absorption towers, process vessels, storage tanks, piping, hood scrubbers, ducts and exhaust stacks. Components made with the Derakane resins are used in industries nationwide, including chemical processing, fertilizer, food processing and mining.

EPA Grants Limited Use Registration To New Mosquito Control Pesticide

The Environmental Protection Agency has announced registration of a "first of a kind" mosquito control pesticide for limited use by public health officials and other trained mosquito abatement personnel.

The pesticide, trade-named Altosid SR-10 and chemical-named Methoprene, is a growth regulating chemical that prevents harmless mosquito juveniles from maturing into pesky adults. The mosquitoes are trapped by chemical action in their larval or pupal stages until they perish. Altosid is produced by the Zoecon Corp., Palo Alto, Calif.

Prior to registration, Zoecon field tested the material under EPA safeguards for the past two years in limited areas of 37 states ranging from New York to Hawaii.

The Altosid registration allows use against one category of mosquito — the "floodwater" variety — in flooded pastures or non-crop areas. Experience with the material, however, may warrant EPA's extending the registration to cover additional mosquito breeding areas. Altosid may be applied by either airplane or ground equipment.

The pesticide appears to offer certain environmental advantages over other EPA-approved mosquito control techniques. It is "specific" to the mosquito; that is, it kills mosquitoes but appears to pose less of a hazard than other mosquito pesticides to applicators, fish, birds and most other wildlife. In addition, Altosid is said to degrade quickly. Most of the material is gone within two weeks, less than half the time it takes other chemical mosquito controls to neutralize. The product also has a low application rate — three to four ounces per acre of water.

Dacthal Available But Tight According to Manufacturer

Diamond Shamrock announced that its Dacthal herbicide is available during 1975, but in short supply, and users should contact their dealer or supplier for material purchase information.

J. R. Wolf, product manager for

The Penn State Turfgrass Alumni Association recently presented a check for $1,400 to Dr. Joseph Duich to aid the turfgrass research program at Pennsylvania State University. From left are: Duich, professor of turfgrass science; G. M. Brennemen, superintendent of Sharon, Pa., country club; Dr. T. L. Watschke, assistant professor of turfgrass science; and Dr. D. V. Waddington, associate professor of soil science. The Association has contributed nearly $10,000 toward research in the past five years.

the herbicide, emphasized, "There are reports Dacthal is altogether off the market and not available at all this year. This is not true.

"Our Greens Bayou, Tex., plant is producing the herbicide at a greater rate than ever before," he said, "And we are continually increasing supplies in the market.

"We're giving it our best effort, and trying to get the Dacthal where it belongs," Wolf said.

Overwhelming acceptance in the turf and agricultural fields has tightened Dacthal supply lines, but Diamond Shamrock stresses there are no plans to remove the product from the market and efforts are being made to eliminate any supply difficulties which may be occurring.

Child Pesticide Accidents Target of EPA Programs

Children under five years old were involved in roughly 70 percent of the possible pesticide accidents reported to poison control centers around the country during the past several years, according to the Environmental Protection Agency.

To counteract this problem, EPA now has several programs underway: 1) Under the 1972 Federal pesticides law, the EPA makes certain that the labeling precautions on pesticides are understandable and adequate to protect persons using pesticides and the general environment; 2) EPA is now developing proposed regulations for child-resistant packaging for certain household pesticides; 3) The Agency is seeking to put into effect a nationwide toll-free telephone number for gathering research information of pesticide accidents and misuse and to serve as a way of disseminating general safety advice to interested citizens.

The EPA also participated, along with other government agencies and private organizations, in National Poison Prevention Week in March. This effort to alert consumers to the dangers of accidental poisoning has been sponsored for the past 14 years by the National Planning Council.

Two free publications dealing with pesticide safety and poison prevention — "Pesticide Safety Tips" and "Safe Pesticide Use Around the Home" — are now available from the EPA Information Center, (PM-215), Washington, D.C. 20460.

Toro, Scott Combine Efforts In Youth Training Program

The Toro Company's Young Entrepreneur program will be expanded this year into 18 new territories, enabling additional hundreds of teenagers to gain on-the-job training in free enterprise.

The program, launched in 1973 on an experimental basis and operated last year in a dozen states, provides schooling and counseling to help youngsters organize and operate a profitable lawn-care business.

A new experimental phase will

(continued)

Why Not Spray the DEPENDABLE Way . . .

SMITHCO

Why are Smithco Sprayers ALWAYS ON THE GO? They're dependable . . . THAT'S WHY!

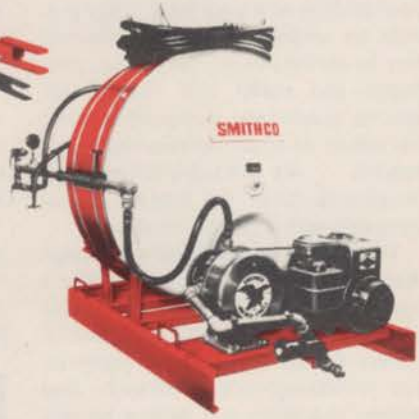
All Smithco Sprayers feature long lasting corrosion resistant fiberglass tanks, (guaranteed for 3 years) centrifugally cast for added strength and appearance. High capacity strainers with stainless steel screen and, mechanical tank agitation. For big jobs select from five models of the HAWK. For smaller requirements there are the LARKS.

A Size for All Occasions

Smithco sprayers are equipped with pumps that produce 10-20-25 GPM up to 800 PSI with tank capacities from 110 to 500 gallons. Available either trailer or skid mounted; gas engine with V-belt drive or PTO; convenient drains, hose and boom outlets.

The Golden Eagle Pump

Dependable, four cylinder, positive displacement, short stroke design for pulsation free operation. Plunger cups that are guaranteed for one year, and Timken Tapered Roller Main Bearings guaranteed for two years. Ceramic valves with Nylatron seats. Longer pump life than any other pump.



SMITHCO

MAKES SENSE FOR '75

SMITHCO, INC., WAYNE, PENNSYLVANIA 19087

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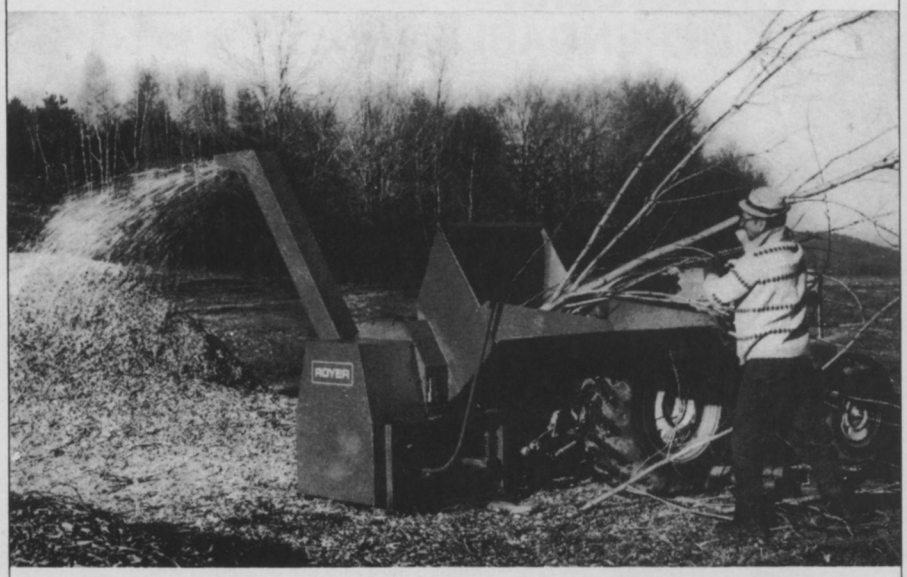
The Royer Chipper.

You won't scream at the cost.

The chipper won't scream at you.



PTO three-point-hitch model 2600

...thanks to a new design concept

Royer's new "2600" Series Chippers are designed to be a lot easier on your budget and your ears. They provide an exceptionally fast, low-cost way to convert brush, branches, trimmings and stalks into chips. And, they're specifically designed to meet the needs of small commercial applications . . . are available in both PTO (three-point-hitch for tractor operation) and self-powered models.

The new chippers feature a design that combines a *rotating anvil** with a heavy-duty chipping rotor that also serves as a blower and flywheel. A unique design that delivers high-output, low-maintenance operation. And quieter operation, too. With a lot less "chipper scream" — because of an operating principle that cuts way down on rotor rpm's without cutting down on output.

Here's how it works: As material is placed in the deep-throated hopper, the rotating anvil self-feeds the material to a high-speed chipping rotor. Steel blades, projecting through slots in the rotor, then slice the material into chips for immediate discharge by the integral blower. Very simple. But very different from other chippers.

We believe you'll like everything about our new chippers. Their performance. Their lower cost. Their quieter sound. You can get complete details by requesting "2600" literature.

ROYER

ROYER FOUNDRY & MACHINE CO.

186 Pringle St., Kingston, Pa. 18704

**Patent pending*

be introduced this year in three areas — Chicago, Grand Rapids and Philadelphia — where sponsorship will be shared with dealers of O.M. Scott & Sons, producers of grass and turf seeds, fertilizers, herbicides and pesticides. Scott's representatives will provide additional training on the treatment of common lawn problems and the use of fertilizers, pesticides and herbicides, and will review examinations required for permits to handle agricultural chemicals.

Charles B. Lounsbury, Young Entrepreneur coordinator for Toro, explained that this experiment may lead to further involvement of O.M. Scott as the Young Entrepreneur program is expanded to all states.

In all areas, youngsters will receive free instruction in safe operation of outdoor power equipment, economics of a small business, care and maintenance of outdoor power equipment and an introduction to agronomy.

Each graduate has access to free counseling from a Toro distributor or dealer during the growing season.

In most localities, the training will be conducted during April at two three-hour sessions. Where O.M. Scott & Sons are co-sponsors, there will be an additional two-hour class.

USDA Publishes New Book On Seeds of Woody Plants

The first reference book on seeds of U.S. trees and shrubs issued by the federal government in more than a quarter century has been released by the U.S. Department of Agriculture.

"Seeds of Woody Plants in the United States" is the culmination of five years of effort by more than 100 scientists at Forest Service research laboratories and special project locations throughout the U.S.

It is a compilation of practical facts about the seeds of some 800 species of trees and shrubs — how to gather, how to store and protect, how, where and when to plant and what to expect. The new 883-page handbook is a completely rewritten and greatly expanded successor to USDA's 1948 "Woody-Plant Seed Manual." It was issued to answer numerous requests from people who, professionally or avocationally, deal with seeds of trees or

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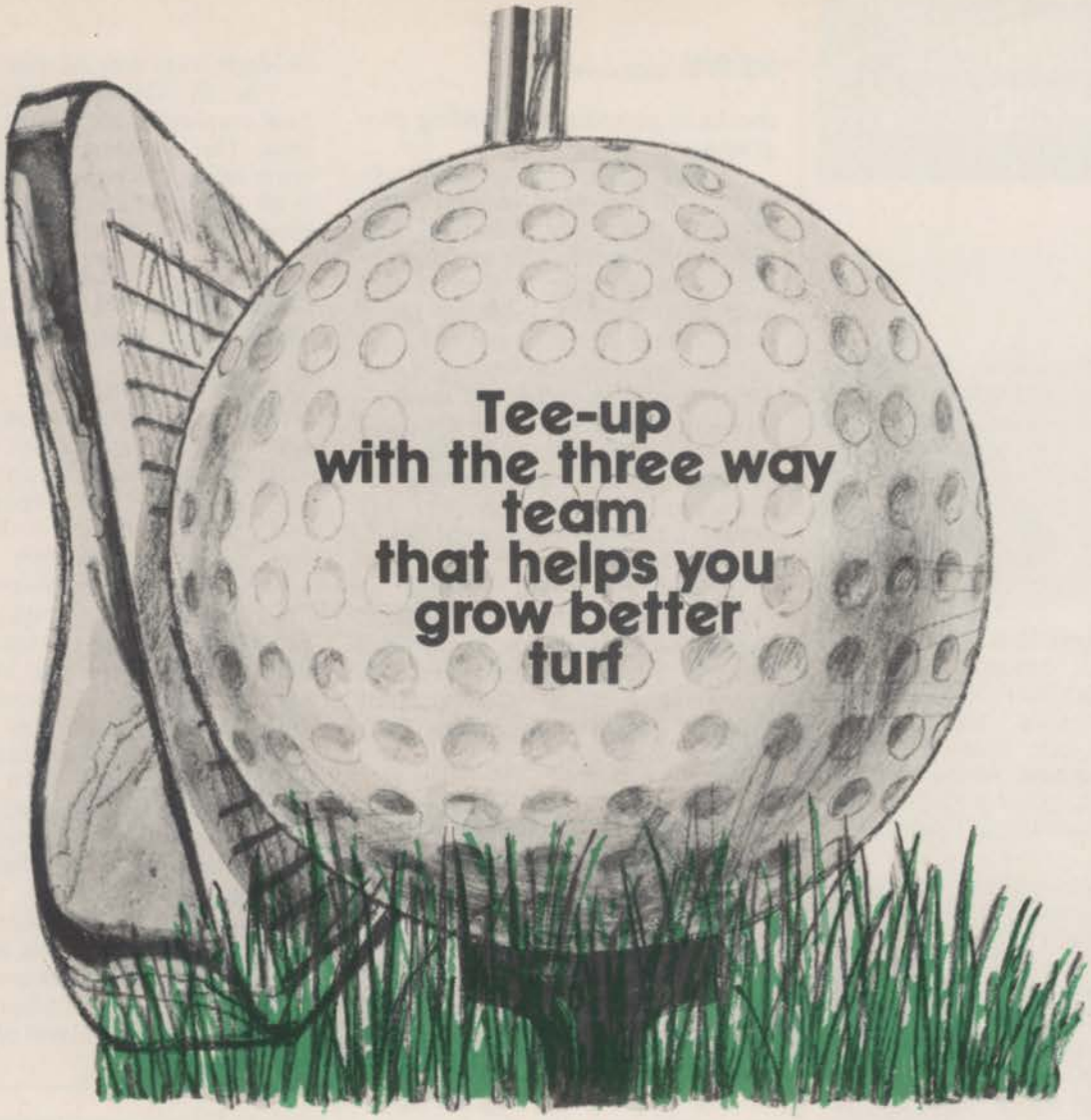

KERB®, FORE® AND TRITON® CS-7

Three proven products from Rohm and Haas to make your job a little easier and your course or grounds more attractive. KERB 50-W herbicide stops Poa annua in Bermudagrass, can be applied anytime from pre-germination to seed formation. FORE fungicide protects turf and ornamentals from a wide range of fungus diseases including Brown Patch, Fusarium blight and certain other damaging diseases of turf. TRITON CS-7 wetting agent has been shown useful in removing dew from greens, and as an aid in increasing water penetration. Ask your chemical supplier for additional information on teaming up these products this year.

ROHM AND HAAS
PHILADELPHIA, PA. 19105

For More Details Circle (137) on Reply Card

MUNICIPAL SPRAYING NEWS

Century's powerful Mist Blower/Sprayer is 4 sprayers in 1, Blower rotates through a 210° arc. 3-point mounted unit equipped with 25-gal. "Poly" tank. Includes sturdy, trigger-type, brass 2-ft. handgun with 25 foot hose. Also has brackets for boom or jet spraying. Delivers 150-mph mist with swath up to 150 feet.

Becomes a handgun sprayer just by turning a valve, adjustable from fine mist to driving stream. Useful in parks, camping/recreation areas, lagoons and swamps, around buildings and storage areas. Can kill weeds in ditches hard to reach with conventional sprayers.

Hook this New 50-lb. Portable Fogger to the 12-volt battery of your pickup or larger truck, tractor or passenger vehicle.

Fill the 5.5-gal. tank with oil-base chemical. Press handgun switch and you're ready to fog an atomized, killing mist anywhere your vehicle will take you. Wipe out mosquitoes, flies and weeds. Works well even in sub-zero weather. Has 15-ft. durable, hi-pressure hose; 3/4-hp. motor, 1200-psi. pump pressure.

Write for further details on sprayers, portable heaters and washers, and central cleaning system.

CENTURY

CENTURY ENGINEERING CORPORATION
221 4th Ave. S.E., Cedar Rapids, Iowa 52401

For More Details Circle (121) on Reply Card

NEWS *(continued)*

shrubs in planting and seeding programs.

The Handbook contains two sections. The first gives general methods for producing, handling and germinating seeds. The second provides data and information on species, alphabetically listed by genus units, giving scientific and common names, flowering and fruiting dates, methods of fruit collection, seed extraction, storage and other data useful for grower and marketer. The volume includes a collection of drawings and photographs for checking the identification of fruits, seeds or seedlings.

Priced at $13.60, "Seeds of Woody Plants in the United States" (Agriculture Handbook No. 450) is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Louisiana Ciba-Geigy Plant Awarded for Safety Record

The first National Freedom safety Award ever presented to a manufacturing plant has been awarded to the St. Gabriel, La., manufacturing facility of Ciba-Geigy Corporation's Agricultural Division.

The award is the highest safety recognition given by the Insurance Company of North America and marks only the second time it has been presented during eight years of existence.

Employees at the plant had previously earned several other safety awards and earlier this year broke Corporation records for days without a lost time accident.

Overall safety, continued efforts to upgrade safety activity and reduction in accident frequency were all criteria used in evaluating the plant for the award. Of the 19 categories reviewed, the facility ranked at the highest possible level for 17 categories and just below that level in the remaining two.

Accepting the award for all plant personnel, Plant Manager John Mincy said, "We are extremely proud that of the many thousand plants reviewed in this safety program, we are the first one to achieve this distinction. Our program's goal, like the award's name, is designed to create a working environment with a freedom from fear of injury.

"At St. Gabriel," Mincy said, "our employees are a most valuable asset. Our program is designed to think safety not only on the job, but in all aspects of life. Each of our 285 people is a safety engineer."

Dixon Initiates New Plant With Open House and Tours

Dixon Industries, Inc., builders of the ZTR riding lawn mower, recently held an open house and tour of their new manufacturing facilities. Located in the Airport Industrial Park at Coffeyville, Kan., the new 52,000 square feet plant is heated by an energy-saving, gas fired infra-red ray system and lighted by mercury vapor lights. Shipping and receiving areas feature two power operated adjustable-height loading ramps.

"We built a plant around the production of our ZTR mower, rather than adapt an existing building to the production requirements of the mower," K. O. Dixon, company president, said.

According to Luther Webb, production manager, the new facility will allow him to cut man-hours, improve working conditions, and maintain the Dixon level of production efficiency.

Robison's Lawn and Golf bags it!

NITROFORM*
organic nitrogen

The nitrogen that pampers delicate turf. Feeds slowly instead of causing surges of growth that can cause stress.

STH74-20BR

HERCULES
INCORPORATED

Turf and Horticultural Products, Synthetics Dept. Wilmington, Delaware 19899

* Registered trademark of Hercules Incorporated

For More Details Circle (143) on Reply Card

E-Z-GO's GT-7 Truck, which was discontinued in 1970, has been reintroduced to the turf maintenance industry this year.

Manufacturer Reintroduces Utility Truck to Turf Industry

E-Z-GO, one of the nation's leading golf car manufacturers, reintroduced their GT-7 Truck at the Golf Course Superintendents Association of America's International Turfgrass Conference in New Orleans, La.

E-Z-GO's re-entrance into the turf maintenance industry was heralded in New Orleans in the form of firm orders. Sam W. Mays, E-Z-GO vice president, sales, said "The golf course superintendents' reception to our GT-7 Truck was extremely positive. Their general comments reinforced our feeling about the need for a heavy duty, versatile, all-purpose turf vehicle."

Bill Lanier, GT-7 product manager, said the three-wheeled utility vehicle was introduced the first of this year, having been discontinued in 1970. "We've always had the GT-7's reintroduction in the back of our minds. It was a popular item, especially with golf course superintendents," Lanier said.

Lanier told WTT that the new GT-7 is quite similar to the original model. Powered by a 20 hp Onan engine and with a two-speed axle as standard equipment, the vehicle has a rated payload of 1,500 pounds. Lanier reported that the truck also features an optional pto.

E-Z-GO is a Georgia-based division of Textron, Inc. The firm is America's foremost manufacturer of golf cars, with distribution throughout the United States, and in Canada and the Caribbean.

For more details, circle No. 701 on the reply card.

ProTurf's Jim Converse Honored by Univ. of Maine

Jim Converse, director of technical services of the ProTurf Division of O. M. Scott & Sons, was recently recognized by the University of Maine's College of Life Sciences and Agronomy and the Maine Golf Course Superintendent's Association for his outstanding achievements in turf education. The special award was present by Dr. Vaughn Holyoke, extension

(continued)

Pacific Agro bags it!

NITROFORM*

organic nitrogen

The odorless, dust-free, pathogen-free organic nitrogen. Applying Nitroform doesn't interfere with normal use of turf areas.

STH74-188R

HERCULES INCORPORATED

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WEEDS CHOKING YOUR LAKE?

Whatever your lake fun, it's MORE fun when you don't have to contend with smelly, unsightly and cumbersome water weeds.

AQUATHOL® K

controls water weeds — fast, efficiently, economically . . . and without harm to the environment or fish when applied as directed. **AQUATHOL K** may be easily applied* to control water weeds around docks or lakefront beaches. For your free weed identification guide and the name of the **AQUATHOL K** supplier in your area, write: Weed Identification Guide at the address below.

STOP

Before using be sure to read and follow directions and precautions on the label of the product

*Many states legislate chemical use in water. Check with your dealer.

PENNWALT AGCHEM

AGRICHEMICAL TECHNOLOGY

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For More Details Circle (164) on Reply Card

crop specialist, on behalf of Dr. Frederick Hutchinson, dean of the College.

Converse, a recognized authority on turf and turf maintenance, is an accomplished auther, illustrator and photographer. Known throughout the turf industry as editor of the quarterly ProTurf magazine and for his two definitive works on monocot and dicot grass identification, Converse was invited to speak at the conference on the topic of photographic techniques as they pertain to turf. His talk included slides of many scenic golf courses, turf insects and diseases and several examples of aerial photography, all of which Converse has produced during the past two decades.

Jim Converse (left) of ProTurf accepts a special achievement award from Dr. Vaughn Holyoke of the University of Maine.

Converse accepted the special award by, in turn, presenting Holyoke and Jack Small, president of the Maine GCSA, autographed copies of his two books, *The ProTurf Guide to the Identification of Grasses* and *The ProTurf Guide to the Identification of Dicot Turf Weeds.*

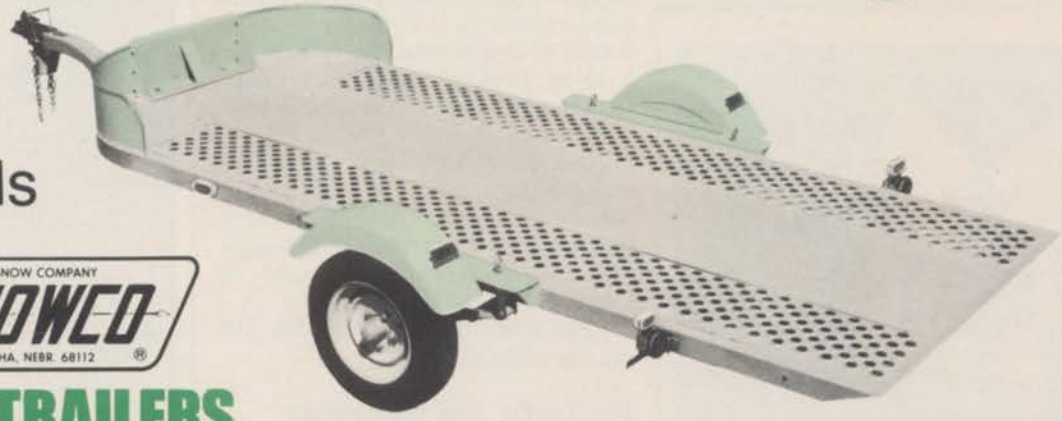
Toro's Irrigation Division Offers '75 Product Catalog

The Irrigation Division of The Toro Company has announced the availability of its 1975 catalog.

The 50-page booklet gives full descriptions, illustrations and specifications for the seven product

The Low-Down on Hauling...

10 Models



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categories for both hydraulic and electric irrigation systems: automatic controllers, automatic valves, residential shrub and pop-up spray sprinklers, commercial rotary sprinklers, large area rotary sprinklers including valve-in-head models, impact heads and quick-coupling valves, and accessories and installation equipment.

The 1975 catalog contains detailed information of the design, materials and performance capabilities that ensure the equipment's efficiency and durability.

There also are illustrated explanations of the workings of automatic controllers and the various types of control valves, plus a layout that shows how controller, valves, heads, pipe, pump and hydraulic or electric control lines are assembled for a complete, typical irrigation system.

Toro makes 4-station, 11-station and 23-station controllers and a wide assortment of automatic valves for both electric and hydraulic systems.

Sprinklers range in size from tiny bubblers to the giants of Toro's 690 series, capable of discharging as much as 95 gallons per minute over a 235-foot diameter circle.

Copies of the new catalog may be obtained from any Toro irrigation distributor.

New Slate of Officers Picked For Landscape Association

The National Landscape Association elected a new slate of officers and directors for 1975 during their recent joint Management Clinic with the Garden Centers of America in Louisville, Ky.

Donald D. Johnson, Johnson Nursery & Garden Center, Sioux Falls, S.D., will take over the presidential duties from Tom Gilmore, Gilmore Plant & Bulb Co., Julian, N.C. Gilmore will serve another year on the Board as director-at-large.

The new vice president is Dale K. Manbeck, Manbeck Nurseries, New Knoxville, Ohio, and Richard Kauffman, of J. Franklin Styer Nurseries, Inc., Concordville, Pa., will assume the responsibilities as secretary-treasurer.

The current directors now include: Richard L. Ammon, Ammon Garden Center & Landscaping, Florence, Ky.; Frank N. Tomlinson, Tomlinson's Select Nurseries, Whittier, Calif.; Gerald W. Harrell, Landscapes Unlimited, Houston, Tex.; and Joe Wayman, Forrest Keeling Nursery, Elsberry, Mo.

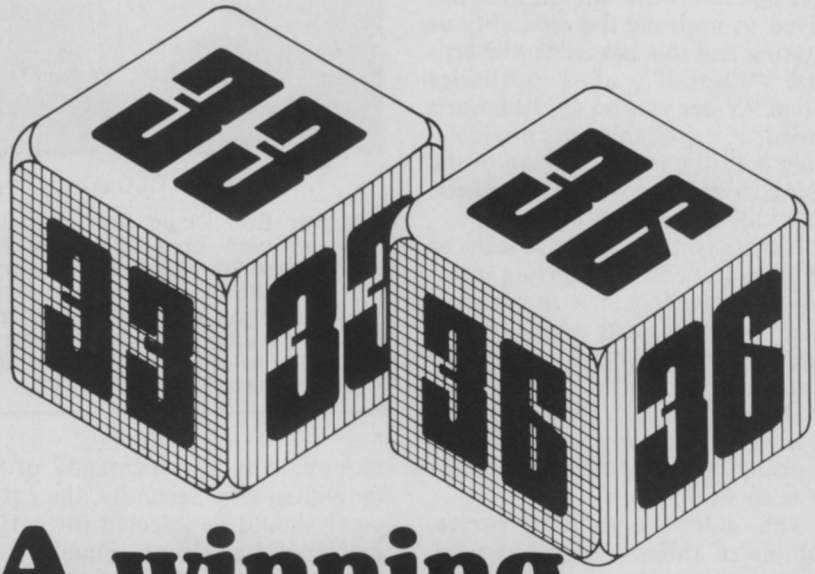
USDA To Back Research On Environmental Stress

Effects of environmental stresses upon ornamental crops throughout the United States will be studied by Oregon State University's Agriculture Experiment Station, Corvallis, Ore., under a cooperative agreement with the USDA.

USDA's Agricultural Research Service (ARS) will provide $25,000 for this five-year study. The EPA is providing funds to get the project underway.

Environmental stresses include air pollution, drought, excess water,

(continued on page 40)



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On greens, weekly sprays during the disease incidence season has resulted in disease free greens all season long.

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Protecting Your Investment In an Irrigation Installation

AN IRRIGATION system is not needed by and for itself; the sole purpose of the system is to assure plant survival and growth. In many areas of the United States, this need can be met by Mother Nature, however, due to erratic rainfall man has strived to improve the reliability of watering and this has led to the artificial "rainfall" of a sprinkler system. Water can be applied when needed, at a desirable time not interfering with the main function of the project, and improving the esthetic quality of the project as well.

Naturally, the consumer seeks to minimize the cost of applying water and (as a new concern), to conserve water. In many parts of the United States, an increase of 10 percent and greater per year in the cost of water has been witnessed. With projects growing in size, so grows the need for an irrigation system if landscaping is to survive.

The golf course is a perfect example of this situation. At present, a minimum single row type system in the East can cost approximately $100,000; the "wall to wall" type coverage needed in the West can cost upward of $400,000. It's obvious that the consumer should be interested in protecting this size of investment. It is not uncommon, however, to find projects with an expenditure of 50 percent over the actual value of what was received, and in other cases, the expenditure is only 50 percent of that actually required. It is not uncommon to find a golf course requiring, as a result of inadequate planning, a complete revision in less than 10 years — or the system incapable of providing the required amount of water in a period of time that does not interfere with play on the course. It is not uncommon to find systems incapable of assisting in maintenance and lowering the maintenance operation cost. And worst of all, it is not uncommon today to find collusion in the promotion and sale of an irrigation system to a golf course.

The first requirement in an effort to obtain the ideal irrigation system is that the system be planned for the requirements and demands of the individual site. Secondly, the equipment should be selected for performance and economy. Finally, a set of clear, concise and complete plans and specifications should be supplied to insure competitive bidding, all bids being based on the same criteria, resulting in the most economic cost figures. Even if the consumer has met all of these requirements, he still needs quality control, someone to supervise the installation and see that the demands of the plans and specifications are upheld. Unfortunately, errors are covered up and may take a number of years to become evident. It really makes little difference whether the error is unintentional or deliberate, the end result is the same. If such errors are allowed to go uncorrected, an untold expenditure can be involved at a later date. All too often, a sprinkler system is conceived by a manufacturer or supplier, designed by a manufacturer or supplier, adjusted by the contractor during the installation and, upon completion, immediately modified by maintenance personnel in order to adequately do the job intended. Too low a cost can explain why a system is a failure, on the other hand very often the cost is great enough to have paid for a satisfactory system. The prejudiced attitudes that prevail in our industry prevent achieving a system in the client's best interests. For the majority of golf courses today, the three major equipment manufacturers render the design, always utilizing their equipment. This design is generally rendered to the consumer at "no cost." Superficially, this seems like getting something for nothing, however, the consumer is intelligent enough to know that he gets what he pays for.

BOB CLOUD

Author Bob Cloud has been involved with or responsible for more than 70 million dollars worth of irrigation systems since his career began in 1948. With this extensive background he feels he is qualified to offer criticism and advice to the irrigation industry.

Generally in a situation like this, the contractor recommended by the manufacturer owes his allegiance to this manufacturer for having referred the lead, therefore, the consumer cannot discuss the pros and cons of the design with his contractor, because the contractor's comments will be slanted to where his "allegiance" really lies. When the supplier provides the design, a similar situation prevails; most suppliers favor a certain line of equipment, based on economic factors. Once again, the consumer cannot discuss the pros and cons of the design with the supplier because he will receive a prejudiced view. What the consumer fails to understand in these situations is that the people involved with sprinkler systems are in one camp — the owner and his money are in the other. He has no one to look out for his best interests and to advise him how the task can be accomplished with greater efficiency and minimal cost. The consumer ends up having no rights at all, other than paying the bills.

If the situation is not stacked against the consumer enough in the previously mentioned procedures, a new twist is now turning up. The manufacturer, supplier or contractor will retain the services of an irrigation consultant to design the course, and will pay all costs involved. The consultant is acting as the professional, but is retained by one of the purveyors and is now under his control. The consumer will ultimately have to pay for all of the costs incurred, but unfortunately he

again has no right to discuss the project with the irrigation consultant and expect an unbiased opinion. The consultant owes his allegiance to his client, and is dictated to regarding equipment and installation methods, and is not retained to supervise the installation.

"I truly believe if our industry is to prosper, certain changes in attitude and an increasing concern for the consumer, will have to occur."

It is readily accepted that an architect designing a building will receive approximately 6 to 10 percent to develop and oversee the project. Most independent consultants don't charge that much, and I feel render an equal service. The one thing the consumer should watch for is paying the consultant too low a fee. In this case, the consultant is more receptive to offers of remuneration from the manufacturer, supplier or contractor to compensate for the inadequate fee.

Beside the biased opinions resulting from low fees, a system is often poorly designed and/or installed because the people involved in the planning are incompetent or ignorant of all the many factors that go into making up a complete system. Inadequacies most frequently occur in pumping plants; if designs are executed by the manufacturer, supplier or contractor, the requirements are usually very vaguely explained and the plant is not thoroughly engineered to meet the requirements and complexities of the irrigation system. This occurs on other features, too; features that could be incorporated into the system for the benefit of maintenance are ignored for fear of costing too much, and the proposal being rejected by the client. However, if the client had been informed of the savings that will result over a period of time, the initial cost does not seem out of line. This information is not supplied through ignorance, and such features are overlooked.

I have yet to see two projects requiring the same type of system, each project is unique and what is

(continued on page 45)

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J20

MODEL C

If your job calls for trenching, it makes sense to look to the people who have the most experience in the industry: Ditch Witch. Ditch Witch built the world's first service-line trencher more than 25 years ago and today offers the most complete range of trenching equipment available. The Ditch Witch Trencher Series is designed strictly for trenching. It includes two compact handlebar units and two four-wheel-drive models — the 18-HP J20 and 30-HP V30. If you require larger equipment, outfit one of the four Modularmatic vehicles as a trencher. The power range is from 30-HP to 100-HP. From 7-HP compact to 100-HP main-line equipment, Ditch Witch has the right machine for your trenching job. That's why today, more than ever, Ditch Witch makes sense.

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nutrient excess or deficiency and cold temperatures. These stresses may alter leaf and root systems in a manner that enhances activity of soil microorganisms. Many of these soil microorganisms are fungi which cause root diseases in plants.

ARS, Oregon State and EPA will cooperate in this study. Dr. Thomas C. Moore, head of the Botany and Plant Pathology Department at the university, is the principal investigator and Dr. David T. Tingey, EPA plant physiologist, is the EPA investigator. Dr. Robert G. Linderman, ARS plant pathologist, is the ARS representative.

Golf Course Builders' Pres. Re-elected to Second Term

For the first time in its five year history, the Golf Course Builders of America (GCBA) has reelected its president and chosen a West Coast contractor as president in 1976.

Frank A. Underwood of Bowie, Tex., was reelected to a second term as president of the contractors' association. Underwood, in addition to heading the Underwood Golf Course Construction Co., is a well-known golfer. He was first elected president of GCBA in 1974 and will remain in the post until the association's 6th annual meeting in Minneapolis next February.

Nick A. Siemens of Fresno, Calif., was named president-elect of GCBA and will become president next year. Siemens is president of Siemen's' Contracting, Inc. In the past 10 years he has built more than 50 golf courses in the West from Arizona to Washington. He is a former school teacher and landscape contractor.

Other officers elected at GCBA's New Orleans February meeting were: Edward A. Hunnicutt of Spokane, Wash., vice president; Eugene W. Witter, Findlay, Ohio, secretary; and Eugene M. Brown, Greenville, N.C., treasurer. Witter is a sales executive with the Hancor Company drainage specialists; Brown is president of Hendrix and Dail, a golf course fumigation firm; and Hunnicutt is president of Krause Landscaping, Inc., golf course builders in the Pacific Northwest.

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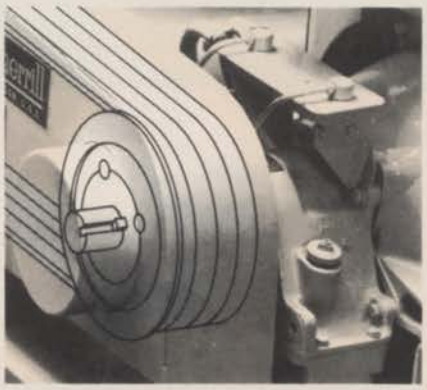
Staggered knife pattern for smoother cutting action. Mounted on an all-steel cylinder that, even without an external flywheel, is heaviest in the industry. Each cylinder revolution gives more cuts, produces smaller chips of uniform size. Self-adjusting knives are reversible; give twice the service between sharpening.



Optional torque converter isolates engine and transmission from cutting shock to minimize maintenance. Makes operation virtually fully automatic; increases operator productive time. Available on all models.

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Herbert Portz (left), Southern Illinois University at Carbondale professor of plant and soil science, presents student Mark Slugocki of Chicago a scholarship from the Golf Course Superintendents Association of America for special interest in turfgrass.

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INJECT-A-MIN STEMIX provides effective results in tree jobs involving:

- **treatment with insecticides and fungicides**
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- **flood damage**
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For your supply of INJECT-A-MIN STEMIX, call your area distributor or the J. J. Mauget Company, Burbank, California toll free 800-423-2699 (except California).
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The current issue of The Feeder Tube, the Mauget Newsletter, is available upon request. Simply write to the address below.

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An Irrigation Gold Mine

THE WAVE of the future? It's the spray of water from underground irrigation systems that automatically sprinkle hundreds of residential lawns throughout Palm Beach County, according to Jack Kouns.

Kouns is president of Jack Kouns, Inc., one of the most successful residential irrigation contractors in the country. He believes his marketplace — Florida's east coast — is the forerunner of the boom in the irrigation industry that officials have been predicting for the nationwide homelawn irrigation market.

"What we're experiencing here is similar to the early years of the television boom," Kouns said.

"We don't have to sell the concept of a time-saving, money-saving irrigation system for a home lawn. Everybody wants it. We concentrate on selling our products and service as the best available."

He continued: "We operate in an area of affluent homeowners whose lawns must be watered 52 weeks of the year. Most of them either don't want to — or can't — spend the time and energy to do it manually. Additionally, the high cost of water here makes everyone conscious of the need to use it efficiently.

"All of these conditions add up to a growth market for residential irrigation systems. While they do not apply with the same intensity everywhere in the country, the differences are only a matter of degree."

Kouns got into the irrigation business quite by accident. He moved to Florida in 1957 after selling his interest in a company that manufactured steel scaffolding in Missouri. "I was looking around for something to get into and ran into a fellow who had a small irrigation business he wanted to sell," he said.

The company had two full-time employees. Now it has 40, a fleet of 25 trucks and a modern office and warehouse facility in West Palm Beach.

"For the first several years we were like everyone else in the business: selling manual systems with plastic pipe. Our business started to grow dramatically when we got into automatic controllers," Kouns said.

The big breakthrough came, he said, with the availability of automatic variable timing when the Irrigation Division of The Toro Company (then Moist-O-Matic) introduced the first of its Monitor series of controllers.

He's been using Toro irrigation equipment ever since.

Before the development of automatic variable-time controllers, he explained, most people felt an underground irrigation system was practical only if they could draw the water from a well. "They reasoned that if they were on municipal water, their water bill would be horrendous, especially if they forgot to turn it off," he said.

Most of the company's installations today, he said, are connected to municipal water systems. "With automatic variable-time controllers, the amount of water — and the water bill — can be governed precisely and varied according to weather conditions."

Kouns reported that until about a year ago, the cost for a residential system kept dropping steadily. "Inflation changed that. But we're still able to provide a system with better performance for less money than 15 years ago."

Although the effects of inflation are uncertain for the future, Kouns said, he expects other technological breakthroughs for irrigation equipment will help keep costs reasonable and expand the market for residential systems.

Kouns has been planning for several years to establish branch operations elsewhere on the east coast of Florida. "We've been growing so fast here, we have not been able to spare any of our experienced people for a branch office," he explained.

But his three sons, all of whom work with him — Andy, in the company's well drilling operations; Cam, in irrigation sales; and Todd, in installation and service — are expecting to help implement the expansion plans.

Kouns was born and raised in Huntington, W. Va. He received his B.S. degree in aeronautical engineering from Georgia Tech in 1943 and a master's there in 1947 after serving as a commissioned officer in the U.S. Navy.

Before moving to Florida, he worked mainly in engineering — for a chemical company, a concrete block manufacturer and manufacturers of scaffolding and folding bleachers in Charleston; Detroit; Warren, Ohio and St. Louis.

Although he eschews a philosophical approach to the advantages of automatic irrigation for water conservation and environmental improvement, he made this observation:

"Unless we want to get covered over with concrete, with people living wall-to-wall, we must have green spaces. We need the beauty of growing things and their help in keeping down noise and air pollution. and we must learn to use wisely our finite natural resources, including water, even where it seems to be plentiful. Modern underground irrigation systems offer the best available technology for water management for maintaining our urban and suburban green spaces."

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1975 State Pesticide Leaders

Final publication of State Plans for Certification of Applicators was made on March 12, 1975 in the Federal Registrar. The job is now up to each state to submit plans and proceed with certification of all applicators. Unless a farm operation is involved, you will be certified as a "commercial applicator."

Your state is probably working on certification right now. Some state fees are high (up to $60 yearly) and some states take a tough stance. And this makes reciprocity with other states rather difficult.

You should be aware of developments in your state. A list of state leaders is provided for your information. Contact them for further details or status of legislation and certification plans in your state.

State—Contact — Telephone

Alabama

Worth Lanier, Chairman — 205/826-4941
Environmental Health Div.
220 Duncan Hall
Auburn University
Auburn 36830

Talmadge Balch — 205/826-4940
Specialist in Pesticide Education

John Elliott, Jr. — 205/826-4940
Specialist, Pesticide Education

Alaska

Peter M. Probasco
Coordinator Agricultural Chemicals
Box 861, Palmer 99645

Arizona

Leon Moore — 602/844-1421
Extension Entomologist
University of Arizona
Tucson 85721

Arkansas

Curtis L. Mason — 501/876-6301
Chemicals Specialist
University of Arkansas
Box 391
Little Rock 72203

California

J. E. Swift — 415/642-0179
Statewide Coordinator—Pesticides
329 University Hall
University of California
2200 University Avenue
Berkeley 94720

J. Blair Bailey — 415/642-5065
Pesticide Safety Specialist & Entomologist

Colorado

Bert L. Bohmont — 303/491-5353
Agric. Chem. Coordinator — 491-5237
College of Agric. Science
121 Agricultural Building
Colorado State University
Fort Collins 80523

Connecticut

Milton G. Savos — 203/486-2928
Extension Entomologist
Plant Science Dept.
College of Agriculture
University of Connecticut
Storrs 06268

Delaware

John S. McDaniel — 302/738-2526
Specialist in Agric. Chem.
Entomology & Applied Ecology Dept.
University of Delaware
Newark 19711

District of Columbia

Gregory Rigsby — 202/727-2113
Acting Director of Ext.
Federal City College
1424 K Street, N.W.
Washington 20005

Florida

J. E. Brogdon — 904/392-1938
Extension Entomologist
University of Florida
Gainesville 32611

J. R. Strayer — 904/392-1938
Extension Entomologist

Georgia

Emmett D. Harris — 404/542-1765
Ext. Entomol. & Pesticide Chemical Coordinator
Ext. Entomology Dept.
University of Georgia
Athens 30602

Hawaii

George Nakasato — 808/948-8139
Assistant Director
Agricultural Production, Conservation & Marketing
University of Hawaii
2525 Varney Circle
Honolulu 96822

Idaho

Hugh Homan — 208/885-6595
Entomol. & Pesticide Chem.Ldr.
Dept. of Entomology
University of Idaho
Moscow 83843

Illinois

Stevenson B. Moore, III — 217/333-6652
Coord., Pesticide Chemicals Program
University of Illinois
280 Natural Resources Bldg.—Urbana 61801

Indiana

David L. Matthew — 317/749-2917
Extension Entomologist
Entomology Dept.
Purdue University
Lafayette 47907

James L. Williams, Jr. — 317/749-2946
Botany & Plant Pathology Dept.
Purdue University
Lafayette 47907

Iowa

Stephan O. Ryan — 515/294-1101
Extension Associate
Pesticide Safety
103 Insectary
Iowa State University
Ames 50010

Kansas

Frank G. Bieberly, Section Leader — 913/532-6107
Extension Specialist, Crops & Soils
Agronomy Dept.
Kansas State University
Manhattan 66506

Kentucky

James W. Herron — 606/258-4898
Extension Specialist in Weed Control
Dept. of Agronomy
University of Kentucky
Lexington 40506

Louisiana

John W. Impson, Coord. — 504/388-2180
Pesticide—Chemicals
Louisiana Cooperative Extension Service
Louisiana State University
Baton Rouge 70803

Maine

Arthur Gall — 207/581-7703
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(Continued on page 54)

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Meeting Dates

Western Chapter, ISTC, 42nd annual meeting, Riviera Hotel and Country Club, Palm Springs, Calif., May 11-14.

Florida Nurserymen and Growers Association, 1975 convention, Innisbrook Resort and Golf Club, Tarpon Springs, Fla., May 22-24.

Turfgrass Field Days and Trade Show, Virginia Polytechnic Institute and State University, Blacksburg, Va., June 18-19.

Michigan Turfgrass Field Day, Crop Science Field Lab, Michigan State University, East Lansing, Mich., June 24.

The Hyacinth Control Society, Inc., 1975 meeting, Hilton Palacio Del Rio Hotel, San Antonio, Tex., July 6-9.

Shade Tree Day, Ohio Agricultural Research and Development Center, Wooster, Ohio, July 9.

American Sod Producers Association, summer convention and demonstrations, Crown Center, Kansas City, Mo., July 17-18.

American Association of Nurserymen, centennial convention, The Palmer House, Chicago, Ill., July 19-23.

Horticulture Research Institute, New Horizons Day '75, The Palmer House, Chicago, Ill., July 23.

Penn Allied Nursery Trade Show, Hershey Motor Lodge and Convention Center, Hershey, Pa., July 29-31.

Turfgrass Field Day, The Ohio State University, turfgrass research plots, Columbus, Ohio, July 31.

Southern Nurserymen's Association, annual convention, Atlanta, Ga., Aug. 3-5.

Illinois Landscape Contractors Association, Summer Field Day, Burr Oak Nursery, Round Lake, Ill., Aug. 6.

Garden Industry of America Market, Las Vegas Convention Hall, Las Vegas, Nev., Aug. 8-12.

Canadian Parks and Recreation Association, annual conference, Quebec City, Aug. 10-14.

International Shade Tree Conference, 51st annual meeting, Heritage Hotel, Detroit, Mich., Aug. 10-14.

Illinois Turfgrass Foundation, Golf Day, Indian Lakes Country Club, Bloomingdale, Ill., Aug. 25.

Turf and Landscape Day, Ohio Agricultural Research and Development Center, Wooster, Ohio, Sept. 9.

Pacific Horticultural Trade Show, San Diego Convention Center, San Diego, Calif., Sept. 13-15.

International Symposium on Environmental Monitoring, Frontier Hotel, Las Vegas, Nev., Sept. 14-19.

Illinois Turfgrass Foundation, Inc., 1975 Field Day and Open House, University of Illinois, Urbana, Ill., Sept. 16.

PROTECTING *(from page 39)*

satisfactory or efficient on one might be entirely wrong on another. For the most part, manufacturers are generally committed to one approach, which they make fit each project, whether or not a more economical or other alternative is possible.

Too much designing is motivated by cost alone. What the industry fails to recognize is that a healthy profit can be realized, at the same time rendering a useful and competent service to the consumer. Until prejudiced direction is eliminated, this plague of inadequacies will continue. Perhaps the consumer will wise up and learn that retaining an independent consultant to look out for his best interests will assist in avoiding waste and confusion. The golf course architect should also be scrutinized. In many cases, he does not possess the ability or does not wish to perform the irrigation design in-office, and instead relies on the manufacturer to supply him with drawings and specifications. The same problem can result here as with the supplier, contractor or manufacturer; once again, the allegiance of the individual is in jeopardy, for the service is more than likely not being rendered in the consumer's best interest.

It is not uncommon that the golf course architect, although acknowledging the need for irrigation, is not overly concerned with this aspect. He might be very capable of producing a good golf course layout, but he often gives little concern to the irrigation, other than the potential fee it brings, he therefore relies heavily on the manufacturer or contractor to see that some sort of system is supplied. The contractor is potentially more aware of the inadequacies than any other individuals involved, but for fear of not being allowed to bid on future projects by the golf course architect, he has a tendency to cover up errors in the design. Result, the golf course architect no longer has control over the contractor.

Covering one mistake involving a few hundred dollars could eventuate a cost to the consumer of thousands of dollars on some portion of the installation not properly performed or completed. It is imperative that an independent relationship exist between the professional and the contractor, as well as no alliance between the consultant and the manufacturer.

Another dangerous situation is the "turnkey" operation. This sounds attractive from the consumer's standpoint, because he designates total responsibility for the irrigation system to the contractor; unfortunately, few contractors are capable of rendering such a range of services. Somewhere along the line in planning, the criteria must be clearly established. The owner can also fail to receive competitive bidding on the project and this results in not only an inefficient tool, but also too high a cost.

It seems obvious that the only way the irrigation system can be the preventive maintenance tool intended, at an economical cost, is with the guidance of an individual who is not only knowledgeable but who receives no remuneration from anyone but the client. The only extra benefit he can receive is the con-

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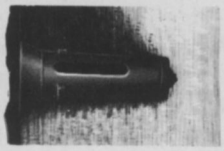

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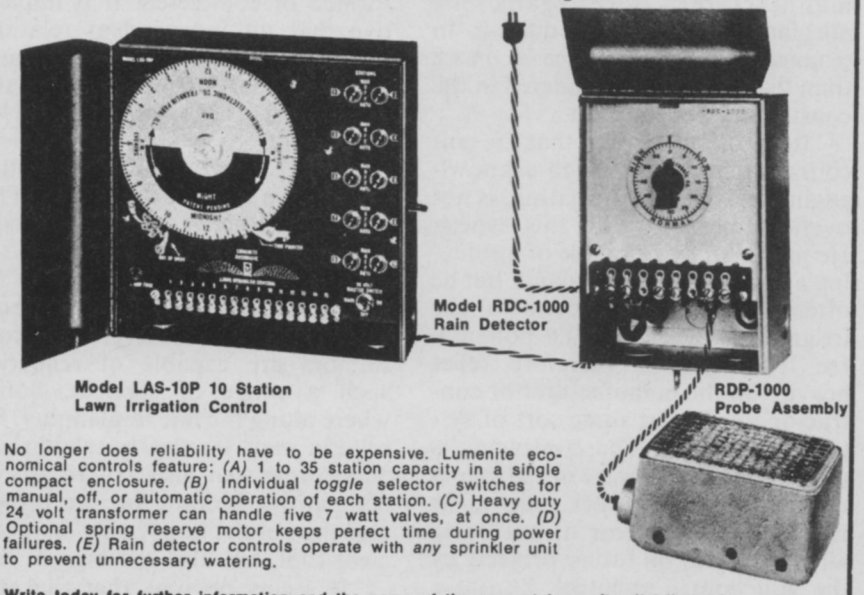

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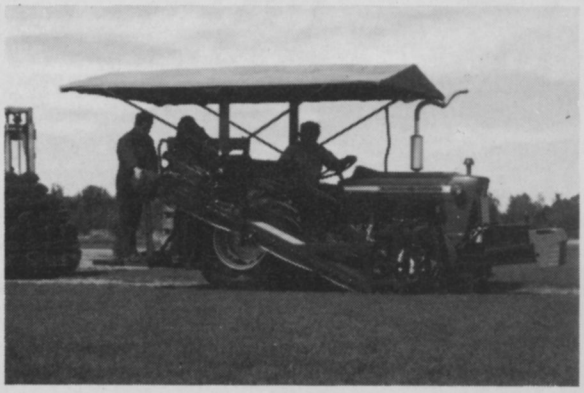

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sumer's future recommendation for a job well done.

On most projects, particularly golf courses, the emphasis is on the esthetic qualities and the main function of the course; the concern over irrigation is solely how much it will cost. Far more is involved in the irrigation than is apparent. However, when the time comes to maintain the course, all of the shortcomings are obvious but it is generally too late and only through large expenditures, or in some cases a complete re-do, can the system be made acceptable as to operation and operating costs.

A sprinkler system has many facets. It is the only entity, outside of the primary function of the project, that affords a return on the investment. It should be thoroughly investigated from all standpoints. The materials used should be of high quality to insure years of satisfactory service. The ease and method of operation, conserving water as well as manpower, should be carefully considered. Maintenance saving features, such as a system to inject fertilizer at the same time the system disburses water, should be considered.

The sprinkler system is not like trees and turf — it can't grow. If not properly executed initially, it is very, very difficult (if not impossible) to correct an inadequate installation. You can always plant a few more trees, but if an inadequate number of sprinklers have been installed, additional heads cannot be simply tacked on. The time for preparation and planning is initially. Even if the consumer recognizes the need for an irrigation consultant, he is still faced with a very difficult decision. Many consultants depend on manufacturer recommendations, and to obtain such recommendations, will owe their allegiance to the manufacturer and will specify his products whether or not they feel the product is truly right for the project.

This is difficult to ascertain. However, applicants should be screened thoroughly. Above all, the resume of the consultant should not be trusted to the point that only the individuals or projects indicated as references are checked. A more accurate picture can be obtained by checking at random with some local contractors and asking their opinion of the consultant. They are knowledgeable and will generally have

worked with the consultant's designs on several occasions. The contractor knows whether the consultant is affiliated with any manufacturers, and whether he is competent.

The client must realize that he is dealing with a close knit group of individuals; the personalities, favoritism or dependence upon each other can be used to the client's disadvantage. I have witnessed situations where a client has checked on a reference of a consultant, and the person in charge of the project (for fear of looking ridiculous) will give a favorable comment on a system that is actually a failure.

The consumer's only salvation is, after exhaustive selection procedures, to establish a complete list of requirements. The irrigation consultant should be bonded for an amount proportionate to the cost of the project being undertaken. The criteria should be established through plans and specifications. Upon obtaining a contractor, he should also be bonded accordingly. After completing the project satisfactorily, a maintenance bond covering a period of two years in the amount of 20 percent of the total cost of construction should be filed. It is often true that even though a guarantee on materials and workmanship exists, this guarantee cannot be exercised because the individual or company is no longer in business.

These measures involve only a relatively small cost expenditure. Due to the fact that the majority of the sprinkler systems are approved through a group or board of directors composed of individuals not necessarily knowledgeable in this area, it is in their best interests to retain a responsible individual to insure that their selection will result in a good installation and who will be fully responsible for any actions in this regard.

The simple do's and don'ts to protect the investment in an irrigation system can be summarized as follows: Don't accept a design from a manufacturer, supplier or contractor, free or otherwise. Don't accept drawings from a manufacturer, supplier or contractor indicated to have been done by an independent consultant. Don't lower the quality of the system to meet the present budget. Do program and phase the project in the event the total funds required are not available immediately. Do investigate thoroughly and select an independent consultant. Do bond this independent consultant. Do bond the contractor selected. Do establish a maintenance contract bond after completion of the installation.

There is an old expression which says "Too Much Or Too Little". There is hardly anything in the world that some man cannot make a little worse and sell a little cheaper. The people who consider price only are this man's lawful prey. It is unwise to pay too much, but it is worse to pay too little. When you pay too much, all you lose is a little money. But when you pay too little, you sometimes lose everything, because the thing you bought is incapable of doing the task it was bought to do. The common law of business prohibits paying a little and getting a lot. It can't be done. □

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SUBIRRIGATION *(from page 22)*

Additional nitrogen was applied to the subirrigation water during the latter part of July and throughout August to promote greener color. This increase in nitrogen fertilization resulted in a two-fold increase in soil nitrogen levels. However, a nitrogen response resulting in greener turf failed to occur until temperatures became cooler in late September and October.

Total utilization of applied nitrogen was extremely poor for the subirrigated treatments. This inefficient use of nitrogen was believed to be related to the anaerobic conditions associated with the subirrigation treatments combined with the effects of high summer temperature. Denitrification or accumulation of toxic substances are possible factors contributing to this situation. This problem of nitrogen chlorosis has not been reported to occur on subirrigated bentgrass grown in cool climates and may be of concern only during prolonged hot weather.

Summary

Subirrigation of turf provides a

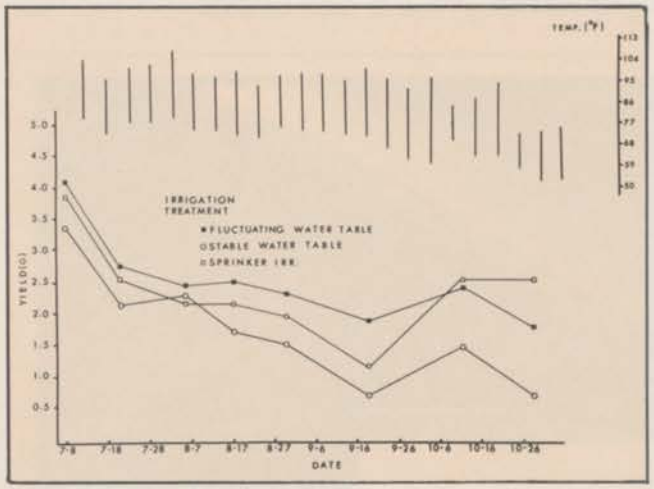

Figure 1: Effect of irrigation treatment and temperature on the yield of bentgrass.

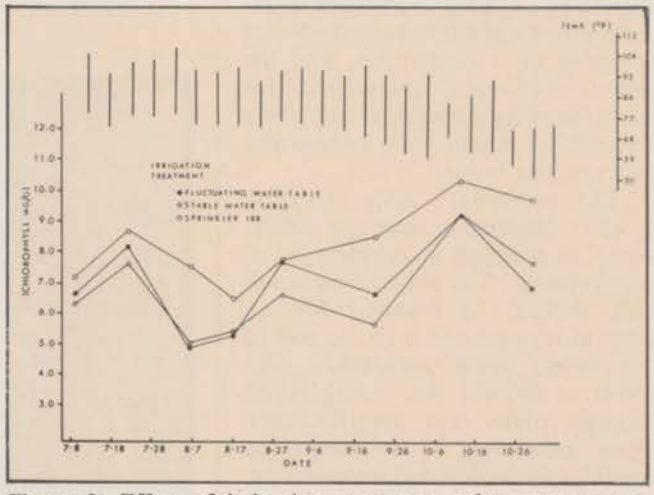

Figure 2: Effect of irrigation treatment and temperature on chlorophyll content of bentgrass.

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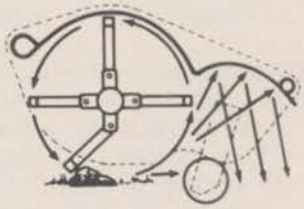

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means for improving irrigation efficiency and effectiveness. The main turf response to subirrigation is that of improved root development. This response is especially significant to the survival of cool-season turf grown during prolonged heat stress. The additional root mass increases the soil volume from which water may be obtained, thus lessening the incidence of drought and need for syringing. Addition of nitrogen to subirrigation water during prolonged periods of high temperature can be detrimental to the turf and should be avoided. Additional work at the University of Arizona has demonstrated that this problem is circumvented by surface application of nitrogen followed by a light sprinkler irrigation. Continued investigations on subirrigation of turf at the University of Arizona should provide additional useful information on this irrigation technique in the near future.

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[2] Daniel, W. H. 1970. PURR-WICK root zone system for turf. Midwest Turf Bull. 40.

[3] Johnson, G. V. 1974. Simple procedure for quantitive analysis of turfgrass color. Agr. J. 66:457-459.

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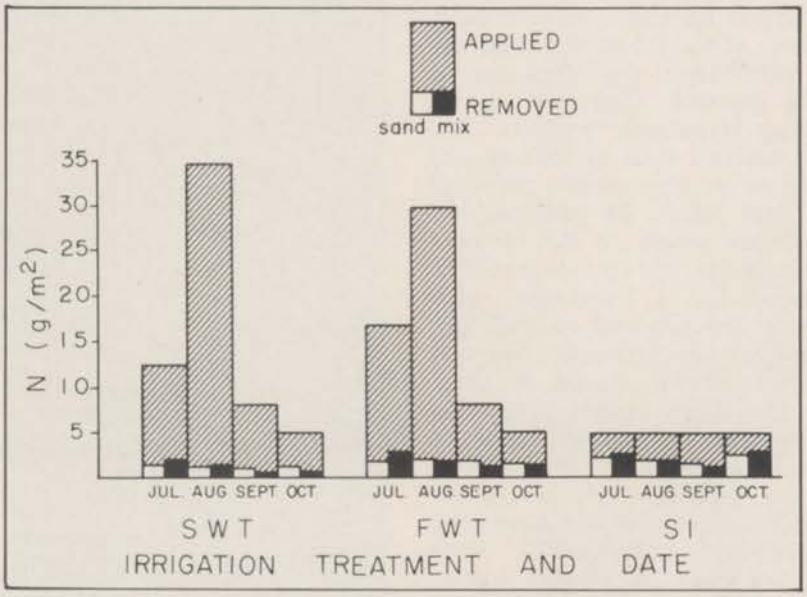
Figure 3 (below): Removal of applied nitrogen in bentgrass clippings as influenced by irrigation treatment and kind of soil during prolonged hot weather.



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CORROSION *(from page 26)*

In the case of the medium piece, when water wore a big enough path through the threads, its jet action then caused erosion of the shank and the tubing joining the nipples. When the tubing was worn down to a thickness less than 1/64 of an inch, rupture of the tubing occurred due to insufficient wall thickness to resist pressure. Reference to the "Piping Handbook" indicates that joint sealants such as litharge and glycerine or glypton are preferred for tight joints. In addition, the Handbook points out that for two-inch pipe size, five threads should be engaged for a hand-tight connection. For two and one-half inch pipe size, approximately five and one-half threads should be used. The Handbook further states that Teflon thread lubricant should be used in assembling threaded PVC plastic piping. This obviously applies to joints that may have to be disassembled subsequently, since threaded joints of PVC pipe may be permanently joined using a thread cement such as PVC cement. This material uses a solvent such as tetrahydrofuran. This solvent is often pigmented blue.

It is therefore the obvious conclusion that someone assembling the copper fittings to the mating PVC threaded pipe used the blue PVC cement as the thread sealant. PVC cement is just that — an excellent cement and solvent for PVC but certainly not a thread sealant. Perhaps the convenience of the PVC cement being available in a can with a half-inch wide brush and applicator was too tempting to certain of the trades, and this cement was used rather than the conventional joint sealants, such as litharge or glycerine or preferably Teflon tape.

The purpose of this paper has been to make available an analysis of a mistake of others so that personnel in the business of installation of underground sprinkler systems would not fall into the same trap that was earlier committed. Proper materials require proper sealants and proper assembly, and no short-cuts. □

TABLE I

Form of Corrosion	Characteristic Appearance	Typical Conditions Causing Attack on Copper
Uniform	Thinning of entire area	Nitric acid, conc. HC1, oxidizing solutions, etc.
Galvanic	Localized attack where dissimilar metals are in contact (copper is usually cathodic or unattacked).	Graphite (or graphitic structure) in a highly conductive solution, such as salt water
Crevice	Attack within a restricted area	Metal-ion or oxygen concentration cells, mainly on metals that depend on oxide or passive films for resistance (not generally true of copper).
Pitting	Localized holes	Oxidizing solutions on partially protected surface (imperfect scale deposit).
Intergranular	Attack at metal grain boundaries	Excess copper oxide eutectic at at grain boundaries
Selective Leaching (Dezincification)	Removal of 1 element of alloy	Un-alloyed copper is immune.
Erosion	Mechanical wear	Water & brine at high velocities, esp. oxygen-saturated fluids
Cavitation	Considerably roughened	Water at high velocities or pulsating pressures
Stress	Cracking by combination of stress and corrodant	Ammonia complexes or mercury in water or air
Soil*	Thinning and/or pitting	Rifle peat soil (pH 2.6), cinders (pH 7.6) and Sharkey clay (pH 6.8)
Stray Current	Localized exterior attack	Electrolytic current from an external source, cathodic to copper.

*Data from "Underground Corrosion", M. Rtmanoff, NBS Circular 579; (1957) Pages 19, 20, 83, 84, 85

This is the two-inch ips male thread-to-tubing nipple soldered to a piece of two-inch tubing, in turn soldered to a two-inch to one and one-half inch reducing bushing, soldered to a piece of one and one-half inch tubing.

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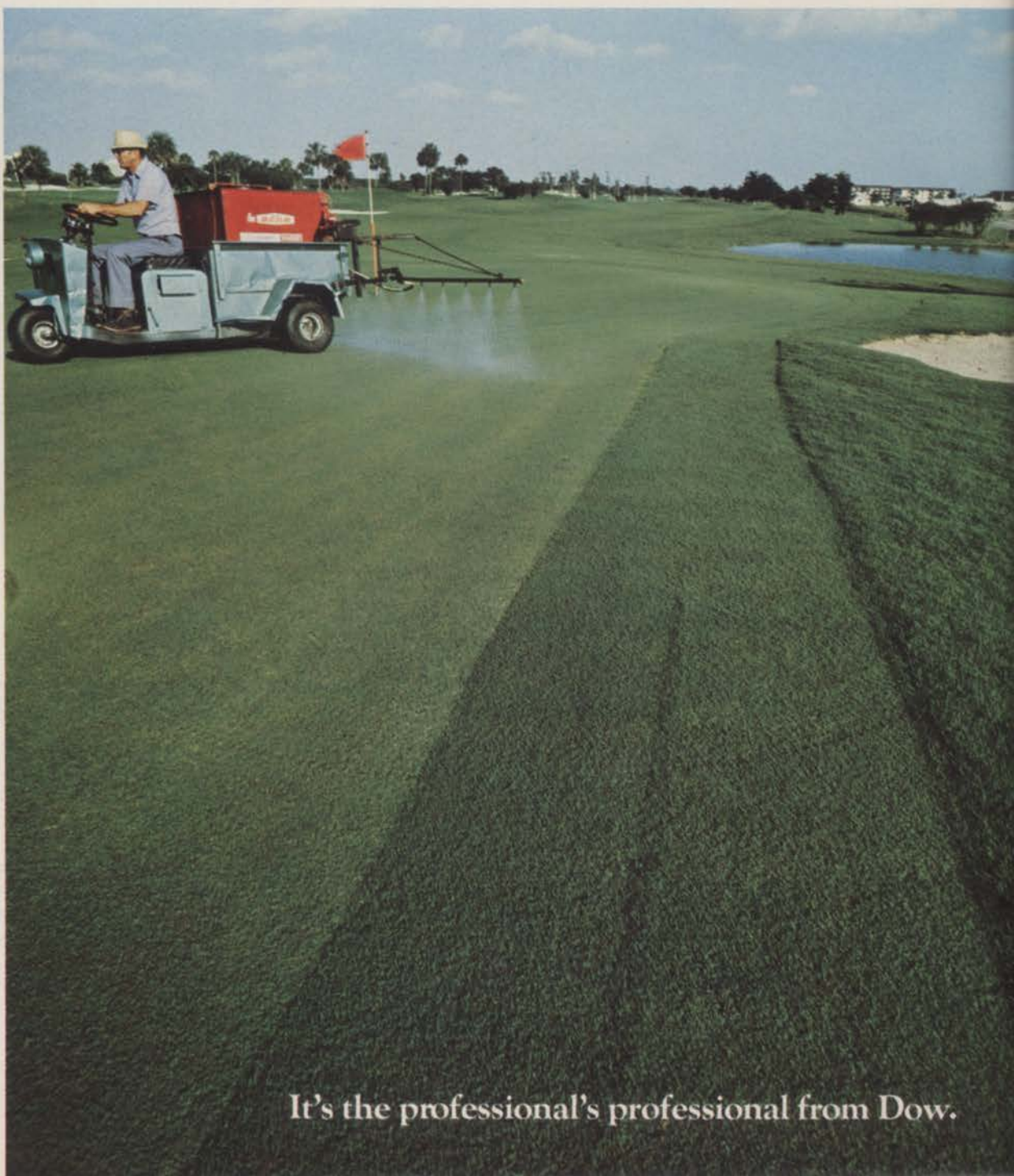

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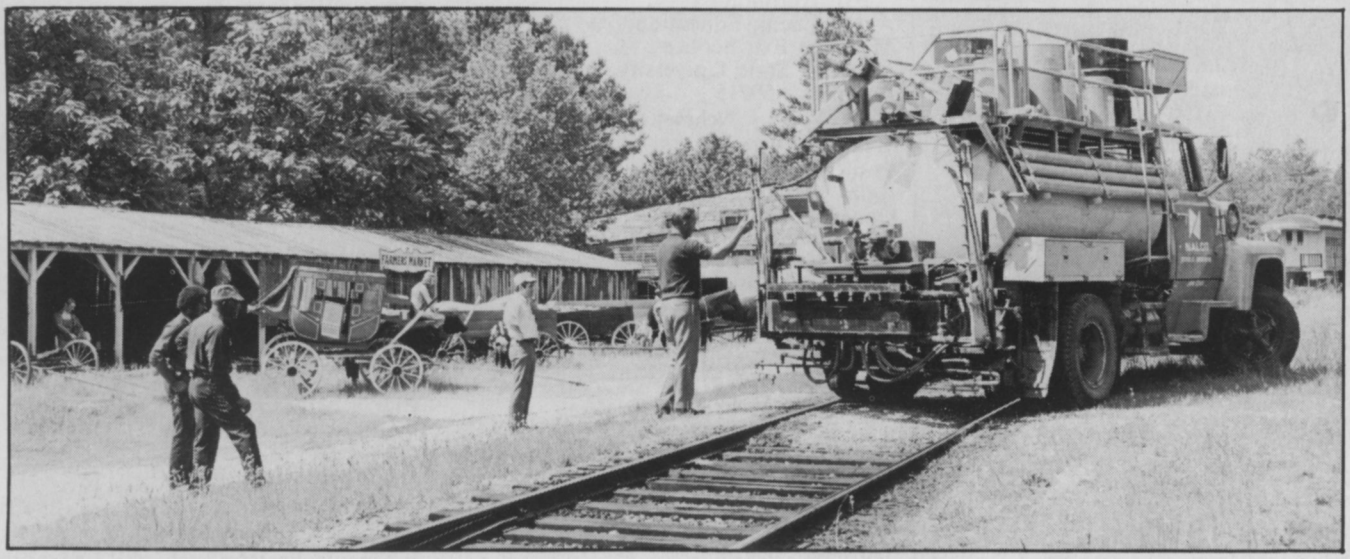
Stone Mountain Scenic Railroad is something to see for a railroad buff, but their effective weed control program is something to see for anyone with a weed control problem. Clear track as far as the eye can see, is the objective of their program.

RAILROAD *(from page 10)*
to try a Hi-Rail on his tracks. Previous sprays were applied with hand equipment. A Nalco Chemical Company truck put out the herbicide treatment mid-May of last year, and "we got results in about three weeks," McAfee says.

Another bonus with the herbicides used is that at normal rates of application they have no direct effect on wildlife or people — and with 2,000 to 3,000 tourists underfoot watching the spraying operations, you can't be too careful and safety conscious. A. H. McAfee is certainly safety conscious lately. He's been replacing the original 60-pound rail that was laid with 85 and 90-pound rail to give his passengers a better ride.

They get quite a ride the way it is. The track was laid out through the lovely Georgia woodland, and scenes along the line do a fantastic job of depicting life in the mid-1880's. There are Indians, train robbers and recreations of towns from the film, "The Great Locomotive Chase." All three of the railroad's engines are replicas and namesakes (General II, Yonah II and Texas II) of the locomotives that took part in the famous Civil War chase of 1862 which started not far from Stone Mountain at Big Shanty (now Kennesaw, Ga.) where a Union spy and his men stole the locomotive, "General." the chase ended in Ringgold, Ga., near Chattanooga.

Even if you're not a railroad history buff, you'll probably enjoy the ride. It starts from under the imposing sculpture of Jefferson Davis, Robert E. Lee and Stonewall Jackson carved out of the face of the mountain. After the ride, there are lots of other things to do — take the mountain skylift, ride a steamboat or visit an authentic ante-bellum mansion. Or you could visit Alexander Hamilton McAfee. And if you want to see him smile, just ask about his weed control program. □



The Hi-Rail truck sets up to spray the residual herbicide and 2,4-D treatment. This versatile on-off track vehicle is faster and more efficient than the hand sprayers the railroad had been using. Background displays the "1880's motif" seen along the track.

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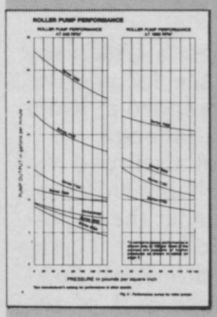

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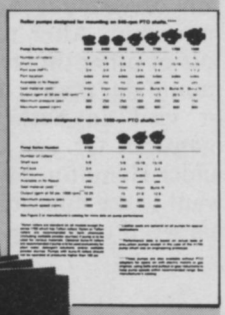

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Blacksburg 24061

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T. Paul Siburt 703/951-6543
Extension Specialist 951-5250
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Fenton B. Sands, Dir. 809/773-0246
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Dept. of Agric. Chemistry
Washington State Univ.
Pullman 99163

West Virginia

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State Ext. Specialist—Safe 293-3912
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University Station
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Laramie 82070

Extension Service

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Extension Service
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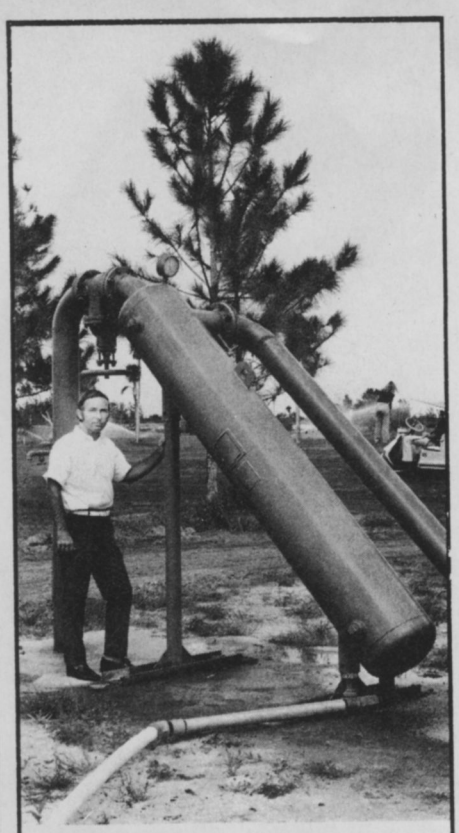
WEEDS TREES & TURF

EQUIPMENT RALLY

JULY
AUGUST
SEPTEMBER

Three months of heavy emphasis on equipment in the green industry. The July, August and September issues of WEEDS TREES and TURF will carry more features, more data, more photographs on equipment than ever before. Rolling stock, engines, tree care and sod equipment, golf cars and course maintenance equipment, tractors, trucks and hand tools. Watch for the biggest green industry equipment rally ever held.



"Without Laval Separators, we couldn't have opened for the winter season." *-Arthur R. Weaver, P. E.*
Perini Land & Development Company
West Palm Beach, Florida

"We were nearly finished with the North Course at the President Country Club. It was critical that we grass immediately to insure play by the coming winter season.

"But we had trouble with sand in our wells. So much sand was entering the electric solenoid control valve that our irrigation system wouldn't function.

"We called on the Laval Separator distributor in our area. They installed two six-inch 600 gpm industrial separators.

"The separators did their job. In fact they did so well, we even bought two more for our South Course. And we've had no further sand problems."

Laval Separators, from 3-4100 gpm, will remove up to 98% of all particles as small as 200 mesh (74 microns). If you've got a problem with sand, call on Laval.

For more information, write: Laval Separator Corp., 1899 N. Helm, P.O. Box 6119, Fresno, California 93727

Dept. 139.

LAVAL SEPARATOR CORP.

For More Details Circle (129) on Reply Card

The lightweight shell of the Eronator can be easily transported by one man. Robert E. Eron, inventor of the device, told WTT the unit's total weight is approximately 100 to 200 pounds, depending upon accessories added.

The Eronator

A Boost for Water Quality

IRRIGATION WATER, sewage treatment ponds, golf course water hazards — did you ever consider the importance of the *quality* of the water you have to deal with each day?

Robert E. Eron, "inventor and developer of marketable and needed inventions," thinks water quality is pretty important, but is too often neglected. On that premise, he is introducing one of his latest inventions — the Eronator — an aerator and treatment device for eutrophic water.

The Eronator is designed to transfer oxygen-laden water to the surrounding water at any predetermined level of the water column. The oxygenated-water outlet may be effectively placed on the bottom of the impoundment, thus causing an upward and outward flow of treated water.

Operation

Floating on the water's surface, the lightweight unit consists of a closed plenum-type exchange chamber which houses the Eronator's sole moving part, a rotating impeller, at the upper end of the intake tube. This impeller forcefully disperses and slings finely divided water into almost a fog, thus increasing the interfacial exchange of water to oxygen and other gases or chemicals which may be within the chamber.

This cloud then collapses back to liquid water with one important difference — it is now oxygen rich. The liquid builds up a pressure head inside the chamber, and the pressure differential (gravity) forces the treated water out the discharge tube down to the desired depth.

According to the St. Petersburg, Fla., inventor, "We are putting oxygen-saturated water into the impoundment by positive displacement, blending or pushing the bad water away. The water that goes down the outlet tube is better water."

Chemical Mixing

The Eronator is also reported to be a highly effective and convenient method for adding prescribed chemicals to water which may be necessary for the well-being of fish and aquatic crops. Herbicides for controlling algae and other nondesirable aquatic vegetation, chemicals for purifying and conditioning water, even medications and feed for improving fish health can all be easily introduced via the mixing chamber, Eron said. Activated charcoal can also be used for controlling water odors and tastes. Chemical mixing through the exchange chamber prevents loss of the chemical from spillage or the danger of contamination to the surrounding environment, including the atmosphere.

There is another obvious advantage to being able to add chemicals (especially herbicides) to the water through the Eronator's mixing chamber: the potential danger of drift when herbicides are applied by surface or aerial spraying is eliminated. By directing a flow of water carrying well-mixed herbicides to the bottom of a body of water infested with submersed aquatic vegetation, the herbicides are placed where they can do the most good — at the root system where they can be readily picked up the plant.

Eron told WTT that preliminary tests and documented research have indicated that most chemicals react more favorably and effectively in a highly-oxygenated environment, thus a savings can be realized by reducing the strength or amount of chemicals needed. Also,

the volume of chemicals required for treatment is reduced since the entire water column is not involved during the treatment process

Sewage Treatment Application

The machine can be used as an aerating and treating apparatus for sewage and industrial waste treatment systems or lagoons, too. Oxygen or other chemicals can be incorporated into the water to aid bacteriological or viral action, control algae and reduce water turbidity.

The Eronator is said to be effective for adding various chemicals used during tertiary treatment of sewage waste waters. The addition of alum, lime or iron salts used to remove phosphorus during advanced waste water treatment can be accomplished by using a modified unit. The chemical is placed in the exchange chamber and the exhaust pipe can be raised or lowered as necessary to get total coverage of the water area, Eron said. The Eronator can also be used to obtain extended and controlled aeration of waste materials such as bottom muds, algae and any accumulation of disintegrated organic or inorganic debris.

Several aeration systems on the market today are designed to introduce air at the bottom of a lake by means of air stones or small-diameter plastic pipe with small aperatures. Some water circulation *does* result from air bubbles rising from the bottom of the lake to the surface. However, the amount of oxygen picked up by the water as the air bubbles rise is rather low, Eron said.

On the other hand, the Eronator is reported to move water which is supersaturated with oxygen to the bottom of a pond where muds and muck can receive maximum benefits of large amounts of highly oxygenated water.

Compared with conventional aerators, "the Eronator doesn't destratify the water," explained Eron. "We want that crud to stay at the bottom, and to allow the oxygen and so forth to work on it there. Then animal life will prosper. You see, what we are doing is assisting a natural process."

Additional Features

Eron said the airtight mixing chamber can be fitted with oxygen or other gas cylinders. This permits high concentrations of gases to be absorbed by water in the chamber, which is then forced downward through the discharge pipe by the weight of the water in the head (gravity). This method of oxygen introduction could be used to prevent low-oxygen or ammonia related fish kills in fish ponds, hatcheries and aquaculture facilities. In the case of fish farms, Eron said many thousand dollars worth of fish can be lost in a short period if oxygen is depleted by an algae die-off, possibly triggered by a period of several cloudy days.

The Eronator can be fitted with filters which will remove suspended particles from the water column while gently recirculating the water. The addition of heating devices can serve to warm water temperatures, and Eron reports that the unit does cool water naturally by condensation within the chamber.

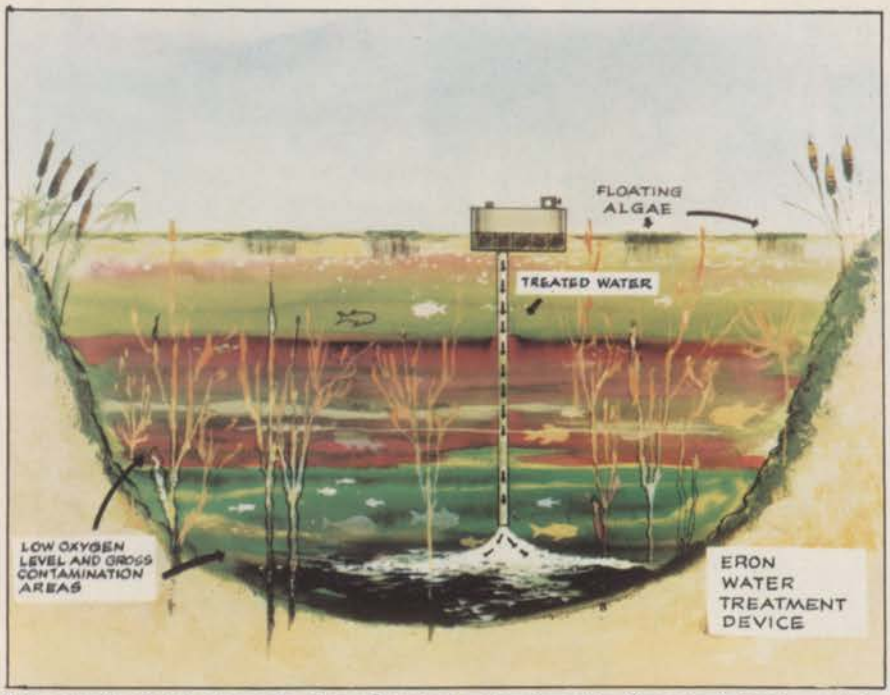
There is a possibility that the unit will also act as a fish attractor, Eron said, and thus actually cause fish to congregate where fishermen can be reasonably assured of success. This fish-attracting feature is one phase of the Eronator's testing program.

Early Testing

In one early test program, the Eronator was placed in a four-acre lagoon near St. Petersburg, Fla., which received water run-off from a sanitary land fill, coupled with sewage sludge. This water had a phytoplankton bloom and substantial growth of filamentous algae along the shoreline.

One section of the lagoon was

(continued)



This artist's sketch shows the flow of treated water down the Eronator's discharge tube, to the oxygen-depleted depths of an impoundment.

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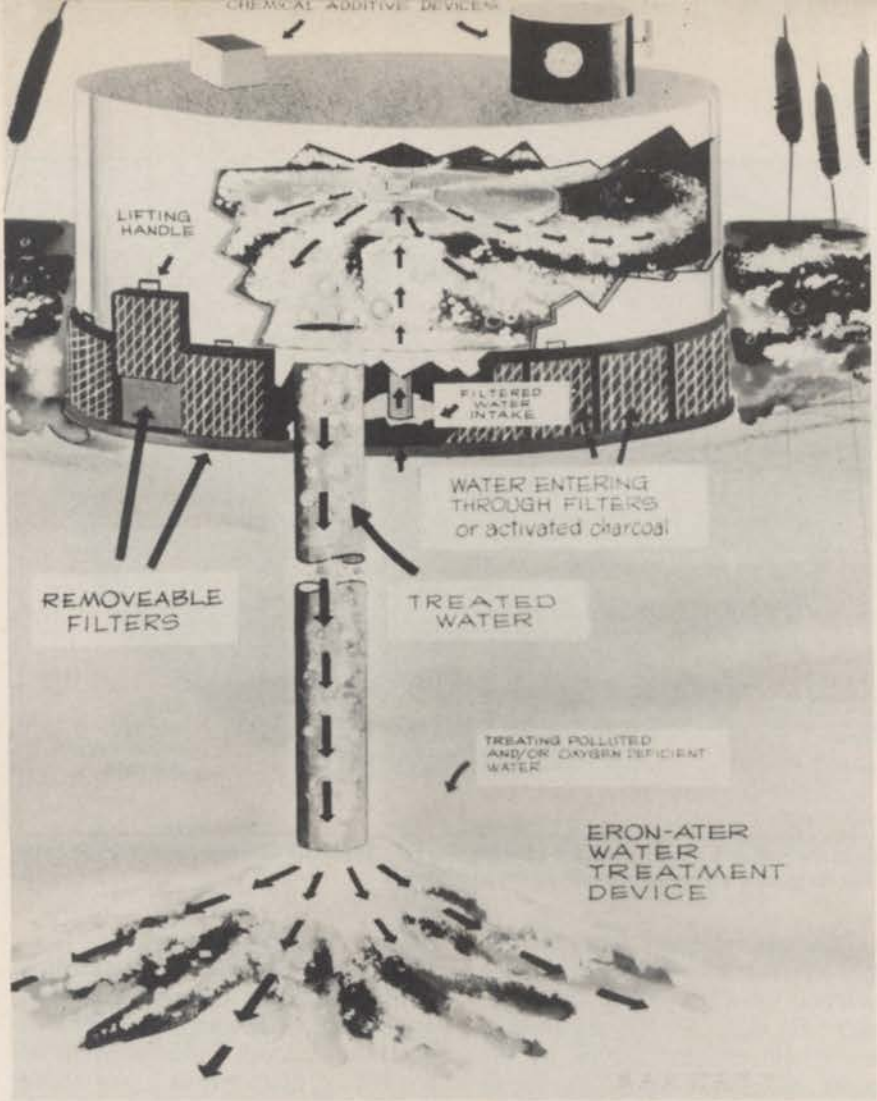

This cut-away drawing shows the unit in operation — filtered water enters through the intake tube, the rotating impeller breaks the water into a fog, and treated water leaves via the discharge tube to the desired depth.

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isolated by means of a plastic barrier from the bottom to several inches above the surface. This enclosure served as a control area for the water quality tests and field observations.

Water chemistry samples were collected before the Eronator was started, after one hour's operation and from the control area. A Hach Water Test Kit Model AL-36-B was used to test carbon dioxide, dissolved oxygen, phenolphthalein and total alkalinity, hardness and pH. The Eronator had been in operation for several weeks prior to the testing period, Eron said.

When tested, the dissolved oxygen on the surface and for a two-foot depth was reported to be the same (7.0 ppm) at an 85 degree F. water temperature, thus indicating that the Eronator was not only circulating the water, but was also maintaining higher oxygen levels in the water column. Tests for dissolved oxygen in the control area ranged from 7.0 ppm at the surface to 4.0 ppm two feet below the surface.

Then the Eronator was started and run for one hour, and water samples were collected at a location adjacent to the reservoir or exchange chamber (Station No. 1) and in the effluent of the discharge hose (Station No. 3).

The surface dissolved oxygen increased from 7.0 ppm to 15.0 ppm after the Eronator had been in operation for an hour. Dissolved oxygen samples collected and analyzed from Station No. 3 indicated 8.4 ppm so the Eronator apparently was increasing the dissolved oxygen found in the effluent of the discharge hose.

Visual observations in the treated lagoon revealed the presence of a high zooplankton population in contrast to the high phytoplankton bloom in adjacent untreated lagoons and in the control area, Eron said. And filamentous algae in the treated lagoon was, for all practical purposes, reported to be non-existent when compared with adjacent non-treated lagoons.

Coliform counts, often used as indicators of fecal contamination in water supplies, were taken by Florida's Department of Health and Rehabilitative Services. According to Eron, a Coliform count of 1,000 is considered safe for swimming. In the control area, the Coliform counts ranged from 7,000 to over 10,000. In the treated areas, the average Coliform count was 100, and was reported to be as low as 20 in some sample areas. Later tests for phosphates, which were made at distances of 300 feet from the Eronator, showed that phosphate levels in the treated areas were significantly decreased — from 25 mg/liter to only .15 mg/liter.

Recent Field Testing

In a more recent Eronator demonstration, Eron was called upon by a group of Lummi Indians in Marietta, Wash., last fall. The Indians operate a 750-acre fish farm and hatchery where they raise salmon, trout and some salt-water species. Conventional methods of water oxygenation were not proving effective, and their fish kills were tremendous.

Although the unit was in operation for only a short time before winter shutdown, it performed quite satisfactorily. According to Jim Ellis, fisheries consultant for the

Lummi Indian Tribal Enterprises, "The machine functioned very well. Oxygen levels were increased from 6 ppm to 9 ppm.

"Dye studies indicated a rapid movement of effluent water from the unit, along the bottom of the pond and towards the far end," he said. "This means that any chemical introduced into the unit would be distributed uniformly along the bottom where the need might be the greatest.

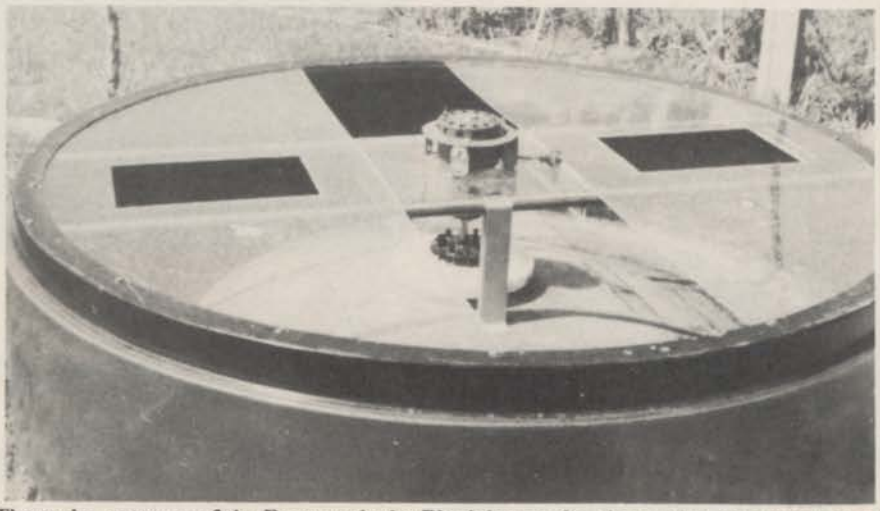
"We feel that the unit will increase dissolved oxygen levels in a pond," Ellis said, "and we hope to use it again in 1975."

Eron has recently been introducing his invention through speaking engagements. He has addressed a group at a Catfish Farmers' Convention in Little Rock, Ark., was on the program at a lake restoration conference in Wisconsin, and has spoken to several civic groups.

Marketing

Eron told WTT that his marketing plans for the Eronator involve franchising it to people in different regions and for different applications, such as fish farms, irrigation water, city ponds, and so on. The machine will be operated and maintained by the franchise holders, except in the case of sewage treatment plants. Eron said that one man can be trained to service possibly up to 100 of the units in his specific field of application. The rental fee will probably be about $800 to $1,000 annually.

The Eronator is just about as near to its perfected state as possible, Eron told WTT. But, he added, there will always be changes and modifications to be made as new uses for his device continue to develop. □



The early prototype of the Eronator had a Plexiglas top for observation. The transparent top was discarded, however, due to cost and sunlight penetration which gave false algae readings and created heat.

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Big Canyon Golf Course, An Engineering Marvel

By W. SCOTT LAMB

IT TOOK A LOT of imagination and some big thinking to create an 83,000 acre environmental park in a semi-arid area 35 miles south of Los Angeles. The rolling hills and canyons defied settlement since the days of California's founding. And with ten million people camped on its outskirts, the area defied the crush of an expanding city until 1969.

Part of the sprawling Irvine ranch, the man-made oasis, now includes complete villages, recreationally self-contained, reaching from the ocean to the Santa Ana Freeway several miles inland.

The Big Canyon Country Club is located much in the center of things; an area which formerly was used for motorcycle hill climbs and trails. According to Greg Arrowsmith, course superintendent, building the course required one of the most expansive ground moving projects since the building of the Panama Canal. The 6,800 yard course winds through canyons, requiring up to 70-feet of fill in laying out the fairways. Robert Muir Graves and Associates were the architects of this fabulous project with Roger Gordon doing the irrigation architecture. There are 155 acres of labeled turf with 32 acres of manicured slopes. The site has 7 lakes holding 8-million gallons of water. There are 2 acres of traps taking in 72 bunkers. The flat land of Big Canyon contains 3,700 trees with twice that number planted on the slopes. To add to maintenance problems there are 9 different types of turf on the course.

Big Canyon has two types of terrain: the Canyon 9 with water hazards and trees and the Highland 9 with a mountain type course. The course was laid out with Bermuda fairways, mixed bluegrass roughs, seaside tees and aprons, and Penncross Bentgrass greens.

Arrowsmith noted that the climatic conditions averaged 70 to 75 degrees year around. Extreme lows and highs range from 28 to 95 degrees. As the Bermuda fairways began to go dormant in the winter months, Arrowsmith considered ryegrass overseeding. The climate was not too hot for perennial ryegrass and indicated a program of overseeding with Pennfine and Manhattan perennial ryegrass, rather than using the old favorite annual ryegrass. Arrowsmith began his overseeding program on 1 and 9 fairways two years ago using a verticut seeder. The bermuda had been going out from 3 to 10 weeks in the winter but Arrowsmith was pleased to find the ryegrass grows upright and helps hold the ball up even through the winter and summer months. He decided ryegrass was a good companion grass for the climate and has started a program of overseeding the balance of the fairways with straight perennial ryegrass, because it comes up strong and dark green. For seeding rate, Arrowsmith experimented with 150, 300 and 450 pounds per acre in his overseeding program. He feels the

Top: **Long view down one of the fairways at Big Canyon gives some perspective of the amount of fill used to create a golf course in a canyon.**
Bottom: **Crew loads ryegrass in vericut seeder in preparation for overseeding bermuda fairways.**

300 pounds per acre rate has worked the best. He uses a Viking verticut seeder, set ½ inch deep with rollers to press the soil back down after seeding. He also cross seeds in three directions to get an even stand. Traffic is redirected on the course until the grass is established by marking off areas for cart travel or requiring golfers to walk from permanent paths to the ball. He has had no problem with disease in his ryegrass program and has not used insecticide or herbicide on the course to date.

Greens fall in the same disease-free category. Arrowsmith's crews hand mow the greens at 3/16 inch five times a week. They use a triplex mower with vertical mowing heads once a week to control thatch and give the greens a good brushing. Traps are all about 7 feet from the green which keeps sand off the greens and allows mowing from any direction. There are two acres of Penncross greens on the course and Arrowsmith has discovered the roots reach 16 to 18 inches deep with most greens showing a 12-inch root system.

The maintenance area of the course is a picture of good organization. Planning is evident at every step of the program. Arrowsmith's maintenance budget is an astounding $307,000, but his 19-man crew maintains not only the course but, also, the landscaped slopes, a dazzling array of flower beds, an Olympic size pool, practice fairways, a driving range, and a large clubhouse putting green. There are about 400 acres in the Big Canyon grounds and about 200 acres are maintained by Arrowsmith's crew. There are twelve men assigned to the course maintenance and seven men working in other club areas. "There is not a man on the crew who would not sit down in a mudhole if it were necessary, to get a job done," Arrowsmith said. He is proud of his entire crew and feels his program of training good men who want to get into the golf course superintendent business is responsible for a top maintenance crew. He hires men on the basis of a two-year training program and each man agrees to that time stipulation when he accepts work with Arrowsmith. A California Poly Tech graduate, Arrowsmith majored in landscape architecture and park administration.

The Big Canyon course drains about 1,000 acres. While it is well tiled, with elaborate and costly drainage system installed, the winter rains are sometimes too much for the drainage system. Fairway wash is sometimes a problem, but the grass waterways have held up quite well without excessive wash.

Big Canyon Country Club is a spectacular example of salvaging unusable ground and making it an attractive recreation and home site area. The beautiful luxury homes bordering the canyon walls add to the setting and the greenness of the entire development is a great contrast to the nearby barren canyons. Water, turfgrass and trees, wonderfully groomed and maintained, have graphically illustrated how man can make an environment. □

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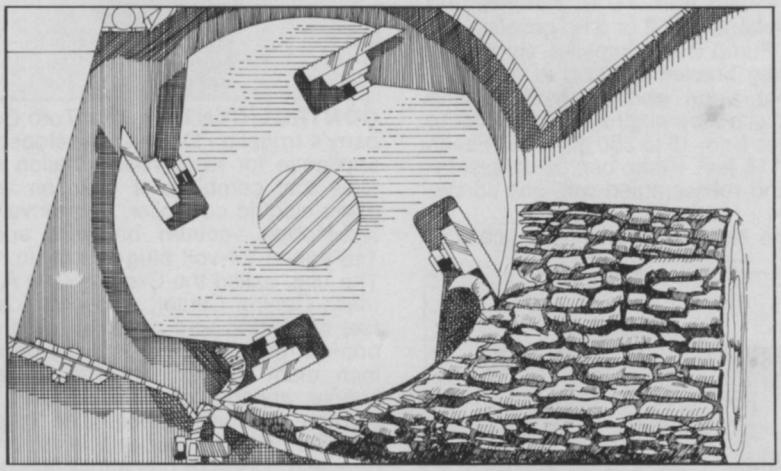

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FMC Environmental Equipment

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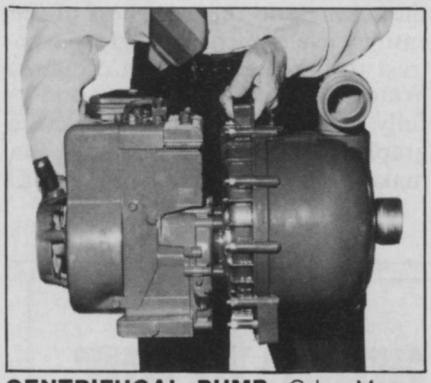
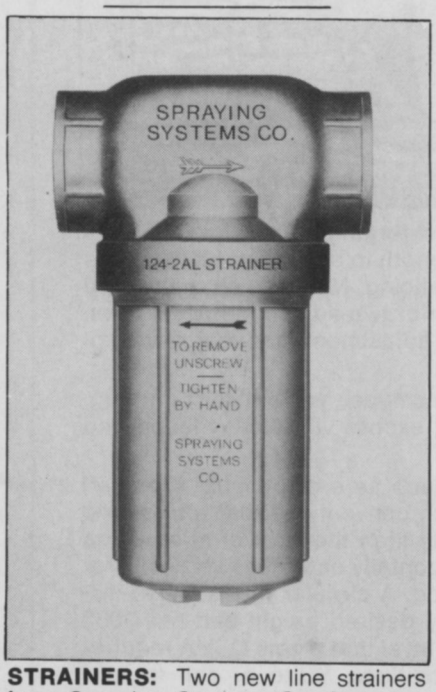
New Products



CENTRIFUGAL PUMP: Orly Manufacturing Co., Inc. announces a new series of self-priming centrifugal pumps molded of glass reinforced thermoplastic polyester. These portable pumps range in size from 1½ to 3 inches and are available with 3 or 5 hp gasoline engines. Pump Body, Impeller, volute and mounting bracket are said to resist impact, abrasion and corrosion. Pump weight with 3 hp engine is 32 lbs. Pump operates from 15 to 250 gpm with heads up to 115 feet. Pump can be disassembled and reassembled with one screwdriver.

Circle No. 702 on the reply card.



STRAINERS: Two new line strainers from Spraying Systems Co. feature a "threaded" bowl for quick removal and cleaning of internal mesh screen. Bowl can be rotated by hand for removal and replacement, with lugs on bottom of bowl to assist in operation. The 124-2 Line Strainers are supplied with 2 inch NPT(F) connections. 124-2½ Line Strainer has 2½ inch NPT(F) connections. Strainer heads are available in aluminum and cast iron with stainless steel screens. Bowls are made of glass-reinforced nylon. Strainers are designed for operating pressures up to 150 psi at 100 degrees F.

Circle No. 703 on the reply card.

CONTROL CENTER: The Toro Company's Irrigation Div. has developed an appliance for residential irrigation systems that combines a 4-station automatic electric controller, control valves, anti-siphon vacuum breakers and a 115-volt-to-24-volt plug-in transformer. The unit, called the Greenkeeper Automatic Control Center, also contains 50 feet of electric wire and is housed in a non-corrosive console that sits on a 5-inch diam. pedestal of PVC. Greenkeeper console can be removed for storage or maintenance. Cap is provided to cover the pedestal when unit is removed. Console has a locking cover. Timing mechanism for Greenkeeper features a 2-day programmer dial with 0-30 minute timing for each station.

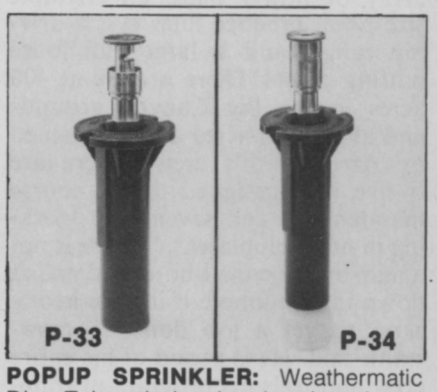
Circle No. 704 on the reply card.

CONTROL VALVE: Rain Bird has introduced a new line of glass reinforced nylon remote control valves. Valves are available for either electric or hydraulic actuation. Constructed of glass-filled nylon, valve can be used in any type of water and provides corrosion resistance. Valves incorporate the following features: low wattage "snap-on" solenoid, patented Grit Filter protection, top removal of internal parts and self-cleaning inlet orifice. Valve can be adapted in field for use either as angle or globe type valve, depending on installation piping requirements.

Circle No. 705 on the reply card.

SEPARATOR: Laval Separator Corp. is introducing a new low-profile unit. Capable of removing 98% of +200 mesh sand and grit with a maximum of 10 psi pressure drop, the separator is available in flow rates from 3 to 4100 gpm. The low profile unit may be particularly desirable in municipal water systems, golf courses, parks and other sprinkler irrigation projects where aesthetics are of importance. A totally redesigned purge control for all model laval Separators has also been introduced which allows solids disposal to be fully automated.

Circle No. 706 on the reply card.



POPUP SPRINKLER: Weathermatic Div., Telsco Industries, has introduced two new polycarbonate plastic sprinklers for lawn and turf irrigation. The P-34 "Lawnmaster" has full 2-inch pop-up action and integral nylon adjustable riser. Left-hand riser threads keep pipe connections tight when raising or lowering body. Full 1⅜ inch riser adjustment eliminates problems with long-stemmed grasses and turf build-up. P-33 "SuperPop" also has 2-inch pop-up action. All working parts of both sprinklers are finished to close tolerances.

Circle No. 707 on the reply card.

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1972 FLECO 26" tree shear, $4500.00. Jim Green, Ohio Chipper & Equipment Company, Div. of Osborne Brothers Tree Service, Mentor, Ohio 216 951-4355.

1 — 1972 FORD LT600 with Prentice FBC 20 foot boom with 210 by-pass grapple, 16 foot dump bed with 5 foot sides. Truck and Concrete Equipment Company, 1244 Home Avenue, Akron, Ohio 44310. Phone 216 633-8230.

1970 ASPLUNCH 12 inch chipper 4 cylinder, like new, asking $2,600. 1974 series 1000 tractor mounted Levco stump grinder, used only 20 hours, $3,900. Edwards Tree and Leasing. Phone 216 967-6750.

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DISTRIBUTORS for D. J. Andrews, Inc. stump cutter teeth, pockets and bolts. Best wholesale and retail price in U.S.A. Add to this exclusive area, local advertising at our expense, etc., and you have our story. D. J. Andrews, Inc., 17 Silver St., Rochester, N.Y. 14611. Call 716 235-1230, or 716 436-1515.

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DISTRIBUTORS WANTED — For Regional Distribution of the Eager Beaver stump Remover. Please reply with pertinent specifics. Full Vision, Inc., P.O. Box 647, Newton, Kansas 67114.

MAN TO WORK AND MANAGE all phases of tree and spray business in Michigan. Salary open. Please send resume, salary requirements, and any questions to Box 129, Weeds, Trees and Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

MISCELLANEOUS

EQUIPMENT SERVICE AND PARTS — New England and New York State. Authorized servicing of aerial lifts and chippers by factory trained personnel. Specializing in Asplundh and Skyworker. Two convenient locations plus complete road service. Service contracts available. Call C.U.E.S., Inc., 603 889-4071 or 203 634-3146.

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Trimmings

Turn about is fair play. WEEDS TREES AND TURF overheard comments from visiting Japanese horticulturalists that their number one insect pest was the American beetle!

A little misinformation upset a Kansas State University professor of ornamental horticulture when he discovered the European Horsechestnut offered under the nut tree category in a widely distributed nursery catalog from Pennsylvania. The listing also contained the statement "covered with large chestnuts in the fall." "The English Horsechestnut is a 'kissing-cousin' of several poisonous American Buckeyes," warns Dr. Ray A. Keen. "Most rural people are aware of the poisonous nature of buckeyes and horsechestnuts, but some urban dwellers may be uninformed." All you Euel Gibbons - types beware.

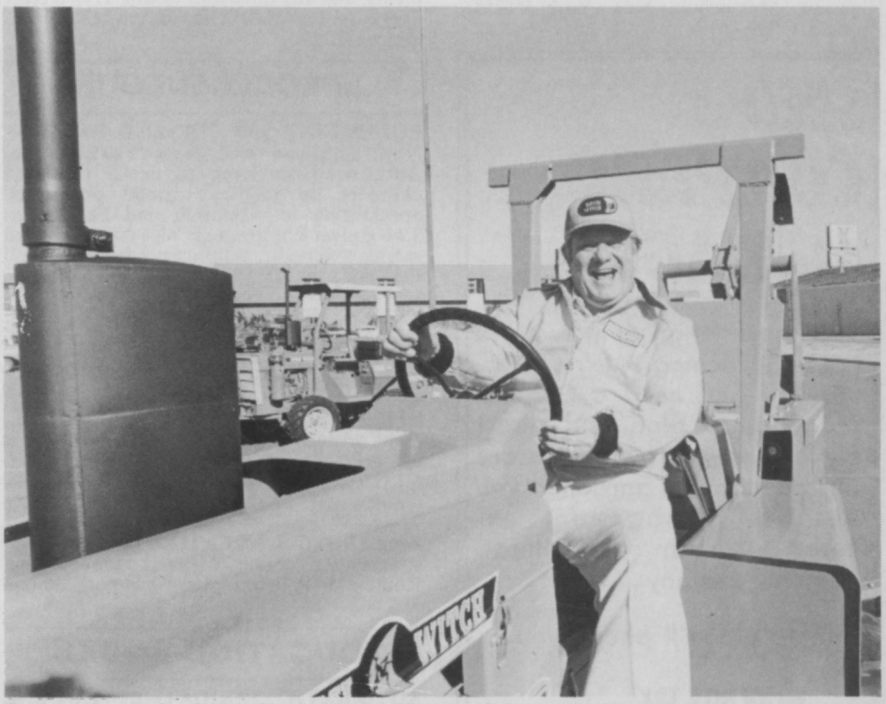
A recent U. S. Forest Service study indicates that trees can add as much as 27 percent of appraised land value. Related studies of half-acre lots show first 6-inch diameter tree adds $300 per lot to appraised value; 10th tree added $200; 20th, $100; and 30th, nothing.

The April 1975 issue of WEEDS TREES AND TURF featured the L.A. Dodgers' spring training camp in Vero Beach, Fla. We weren't the only ones impressed by the facility's turf condition. Robert Markus, a *Chicago Tribune* sports editor, after touring the majority of the training camps in Florida wrote in his March 19th column: "The Dodgers' training complex is the best I've seen — and I've been to every camp except Montreal's, Detroit's and Boston's . . . The playing fields are as well-groomed as a golf course. The infields are like putting greens." Sounds like a homerun for superintendent Bill Moolenaar.

EPA recently hired a new Deputy Assistant Administrator for Pesticide Programs. "Edwin Johnson has been intimately involved with organization, policy and budget issues in EPA's pesticide programs since the Agency's beginning. His two years of experience as director of pesticide operations and strategic studies make him well prepared for his new post," said EPA boss Russell E. Train. The pesticide program is in the midst of implementing several far-ranging regulations. Standards governing the certification of pesticide applicators and new regulations for the registration and classification of pesticides will increase environmental protection and provide safe, effective products for farmers and other users, said Train.

It's back to school for some Massachusetts arborists this summer as they sign up for a course on the recognition and control of common diseases of the shade and ornamental trees of Massachusetts. The course is being offered at the request of the shade tree industry and will be geared primarily to meet the needs of the professional arborist and municipal tree officials. Classes will be held at the University of Mass. in Amherst.

A new, 42-page directory of the leading builders of the country's golf courses is now available without charge from the Golf Course Builders of America (GCBA), an association of major golf course contractors based in Washington, D.C. The directory contains listings and biographies of the association's members, both builders and suppliers, along with a selected number of advertisements. Contractor pictures and biographies identify the members and list their recent golf course construction jobs thereby giving architects, land developers, recreation groups and government recreation officials an opportunity to check the work of the members. The Golf Course Builders of America, located at 725 15th St., N.W., Washington, D.C. 20005, will send the pocket-size directory upon request. GCBA was organized five years ago by a group of middle-Atlantic golf course contractors. The association now has members from coast to coast and recently held its fourth annual meeting and exhibit during the New Orleans convention of the Golf Course Superintendents Association of America. Membership in GCBA is open to qualified golf course contractors if they meet construction experience requirements. Suppliers to the industry are accepted as associate members.



Country humorist Jerry Clower has been retained by Ditch Witch to help promote their line of underground construction equipment. Clower made more than 200 appearances during 1974 telling the stories made famous on his albums. He is a featured performer on the Grand Ole Opry and has made scores of radio and television appearances.

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Proportional Mixing: A New Sprayer Idea

IT IS INTERESTING that there has been very little effort devoted in the past 10 to 15 years to the development of pressure compensated spray equipment. One gets the impression that everyone has been so busy trying to refine existing spray outfits that very little attention has been directed to new and different concepts in chemical spraying.

But this is not true. Soaring chemical costs, increased threat of short supplies and operator safety have prompted a few people to look upon proportional mixing with renewed interest.

John Beheyt is one. As president of Eastside Spraying Service, Kirkland, Washington, he has been working on his own spray rig design for nearly 15 years. And the "brains" of his unit is a pressure compensator.

"My first real reason for attempting to design this outfit was safety," said Beheyt. " The original concept would eliminate the need to handle chemicals and improve the accuracy of mixing and applying."

Beheyt's safety features eliminates flushing out the tank containing unused pesticide mixtures. Because the tank contains nothing but fresh water, there is no corrosive action in the tank by the residue.

In early 1974, Beheyt built a prototype unit using commonly available parts. A Delavan pump is mounted on the front bumper and connected to the truck engine with a 90 degree Ohio gear box and an air clutch. The spray pump is an 800 psi, 55 gpm John Bean positive displacement unit with its pressure regulator removed. This unit is presently in operation on his tank truck.

An improved unit is now being manufactured which incorporates the original five components into one mechanical unit. Beheyt expects the new unit to be ready for market in late spring.

The single unit spray outfit is 18 inches wide, 24 inches high and 52 inches long. With the engine it weighs 1,800 pounds and without 1,100 pounds. Beheyt, with the help of Weyer engineering and Manufactiring Co., Enumclaw, Wash., has designed the unit to adapt to most existing rigs. Market price has not been determined.

"The beauty of this outfit is the chemical handling system," Beheyt points out. "The chemicals are supplied in recyclable five gallon containers and attached to the hose line leading from the truck tank by a "dry break" coupler. The operator never touches the chemical." The cans come sealed from the formulator and are returned empty but still sealed.

John Beheyt demonstrates his 1974 prototype sprayer at last year's International Pesticide Applicators Association meeting in Seattle.

The flow rate is controlled by volume. As the water leaves the tank through the hose line, the chemical is injected at a predetermined proportion and the two are mixed before reaching the nozzle.

The pressure compensated pump operates only on demand so no mixing takes place unless the spray gun is in operation. Mixing can be controlled within plus or minus one percent accuracy. The variable displacement pump operates only as needed, so the spray nozzle controls the entire operation.

The pump can inject two different chemicals at the same time or the operator can switch from one to the other, since it is actually two pumps in one. The entire system shuts down the instant the nozzle is closed and the only mixed spray left over is that in the hose between the nozzle head and the proportioning pump. This can be flushed by removing the concentrate can and running water through the hose for a few seconds.

"Additional injection lines can be added to mix more than two chemicals in variable amounts at the same time," he said. It is also capable of pumping a wettable powder in solution by the addition of a small agitator.

There is no waste or spillage with Beheyt's system. The tank life is extended because nothing but water touches its walls. And with increased federal regulations on operator safety and chemical handling, Beheyt feels this type sprayer may be the system of the future.□

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Jamestown is perfect for a bluegrass blend, particularly Baron. It has great eye appeal and when sod is needed for sun and shade areas Jamestown/Baron really go well together.

One more comment from Berkley. . ."*When you've got a good thing going — stick with it.*"

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